TABLE OF CONTENTS

TABLE OF CONTENTS

Chapter I

Purpose of and Need for Action

Introduction

This chapter describes the proposed action for management of the Swauk Sheep Allotment, the purpose of and need for this proposal, and the project area. This chapter also outlines legislative and environmental documents to which this environmental analysis is tiered, reviews the decisions that will be made based on the analysis and summarizes scoping and public involvement for the project. Issues associated with the proposed action and measurements selected as indicators for each issue are defined. Preliminary issues that were considered but not carried through the analysis are also reviewed.

The Proposed Action

The Forest Service Supervisor for the Okanogan-Wenatchee National Forest proposes to authorize continued livestock grazing on the Swauk Sheep Allotment (Swauk Allotment) on the Cle Elum Ranger District beginning in 2010. This proposal includes authorizing grazing of 1,000 ewe/lamb pairs for 93 days from June 10 to September 10 within the Swauk allotment. The proposed action would authorize an adaptive management approach which would allow for 1) rerouting of livestock in the vicinity of Pine Creek and Williams Creek if current management does not result in adequate revegetation in designated areas, 2) an alternative to the crossing at Iron Creek to avoid impacts on restoration efforts should they occur, and 3) rerouting and/or barrier installation to protect the Swauk Campground water system, if needed. In addition, the proposed action includes monitoring requirements to be used to determine if/when conditions or standards have been exceed and if there is a need to consider an adjustment to the existing management strategy. Monitoring is proposed to assess revegetation success at Pine and Williams Creeks, crossing compliance at Iron Creek, water quality at Swauk Campground, and to ensure recently identified sensitive plant populations are not adversely impacted. Monitoring would also consist of regular inspections of the operation over the course of the grazing season, including: range readiness monitoring, utilization monitoring and bedground and general routing and permit compliance.

Decisions made relative to the activities proposed in this analysis would be implemented beginning spring 2010 and would result in issuance of a domestic livestock grazing permit. The duration of this grazing permit is anticipated to be ten years. The selected grazing strategy would be documented by revising the existing Allotment Management Plan (AMP) and associated Annual Operating Instructions (AOI). The proposed action is described in detail (with maps) in Chapter II under Alternative 3.

Purpose and Need

The purpose and need for this proposal is prompted by desired future conditions identified in the Wenatchee National Forest Land and Resource Management Plan and Section 2001(b) of Public Law 104-19, commonly known as the 1995 Rescission Act. The Forest Plan places emphasis for management on revision of outdated range allotment plans; and like-wise, the Rescission Act requires that each National Forest establish and adhere to a schedule for completion of National Environmental Policy Act of 1969 (NEPA) analysis on all active grazing allotments. At the time of this analysis, there was no current allotment management plan on record for the Swauk allotment. Available permit administration documentation indicates that as newly adopted land and resource management plans have come into effect, the associated standards and guidelines have been incorporated through permit modifications and annual operating instructions (2004-2009).

Specifically, the Wenatchee National Forest Land and Resource Management Plan (1990) as amended by the Northwest Forest Plan in 1994 and the Pacific Northwest Region Invasive Plant Program Record of decision in 2005 (amended LRMP) developed land allocations that institute new resource standards and guidelines relative to soil, water and fisheries; vegetation and invasive species; special and unique habitats, and; plant and wildlife species of concern. While great effort has been made to incorporate newly adopted management objectives and associated standards and guidelines into the present management strategy, an integrated analysis of the larger-scale management scenario is now warranted to ensure that allotment conditions meet or move toward the desired future condition relative to all of the applicable standards and guidelines.

In addition to the incorporation of LRMP requirements into the permit and annual operating instructions, changes have also occurred relative to the vegetation resource that provides forage for grazing ungulates. Through the 1980s, timber harvest was the primary management emphasis on a large portion of the project area. Removal of the overstory vegetation across relatively large areas of the landscape encouraged the growth and development of grass and forbs in the understory that consequently, provided forage for grazing ungulates [i.e., the creation of transitory rangeland - or rangeland (forage) that is not permanent but, a function of a disturbance such as fire or timber harvest]. The number of domestic animals and season of use authorized in the existing allotment management plan was based on the availability of this forage. Over the last approximately 15 years, a reduction in the amount of timber harvest, as well as the successful suppression of fire, has resulted in dense overstocked forested communities. Subsequently, this has resulted in a reduction in the amount of understory and therefore, herbage production. Concurrent to the decrease in herbage production, there has been an increase in the number of wild grazing ungulates that utilize this forage. There is presently a need to re-evaluate the forage that is available for domestic livestock grazing.

The purpose and need for this proposal is therefore two-fold: 1) to determine the amount of available forage and provide for an appropriate level of domestic livestock grazing as set forth in the Wenatchee National Forest Land and Resource Management Plan (1990)

and 2) to ensure that authorized grazing complies with applicable federal environmental laws, regulation and Forest Service policies and procedures, specifically in relation to the amended Wenatchee Forest Plan standards and guidelines. Because the Wenatchee Forest Plan recognizes the continuing need for forage production from the Forest and previously determined that these allotments were suitable for livestock grazing, there is a need to continue domestic sheep grazing on this allotment. However, because it is also recognized that there may be a need to maintain or improve resource conditions in specific areas, this proposal presents management strategies that are intended to address multiple resource objectives. This proposal not only assesses the current availability of existing transitory range but also the potential for previously unidentified resource issues associated with 1) soil, water and fisheries and 2) plant and animal species of special concern, 3) special and unique habitats 4) invasive species and 5) cultural properties. In this regard, there is a need to monitor allotment conditions to ensure standards are being met and to identify when there is a need to consider a change from an existing management strategy. The need for management flexibility during implementation of the proposal is a consequence of the nature of the proposal itself; which includes a relatively large analysis area with potentially changing environmental conditions that may affect implementation over time.

The Project Area

The Swauk allotment is located on the Cle Elum Ranger District in portions of the Swauk and Teanaway watersheds (Map I-1, Appendix A). The allotment is within T20N. R17E., Sections 1-3, 5-6, 11-15; T20N. R18E. Sections 4-9, 18; T21N. R16E. Sections 1-2, 13, 24-25, 36; T21N, R17E. Sections 1-36; T21N. R18E. Sections 1-11, 15-21, 28-33; T22N. R16E. Section 36; T22N. R17E. Sections 27-28, 31-35; and T22N. R18E. Sections 34-36.

The allotment is bounded on the north by the Wenatchee River Ranger District (Chelan - Kittitas county line), on the west by the Wenatchee National Forest boundary west of Teanaway Ridge and Redtop Mountain, on the south by Mill Creek and the Wenatchee National Forest boundary, and on the east by Lion Rock, Table Mountain, Diamond Head and Tronson Ridge. The Swauk allotment encompasses 47,914 acres. There are 1,105 acres within the allotment that are privately owned including the area in the vicinity of the town of Liberty and Williams Creek (Table I-1 below, and Map I-2, Appendix A). The Swauk allotment is entirely within the boundary of lands ceded to the United States under the Yakama Indian Treaty of 1855.

Table I-1 – Land Ownership within the Swauk Allotment (acres)

Forest Service	Private	Total
46,809	1,105	47,914

Northwest Forest Plan land management allocations for National Forest administered lands within the project include: Administratively Withdrawn (ADMWD), Late-Successional Reserve (LSR), and Matrix. The total acres that occur within each

Northwest Forest Plan land management allocation and their location are shown in Table I-2, below and Map I-3, Appendix A.

Table I-2 – Northwest Forest Plan Land Management Allocations within the Swauk Allotment (Acres)		
ADMWD	**LSR**	**Matrix**
<1	46,711	98

Wenatchee National Forest land management allocations within the project area include: General Forest (GF), Dispersed Recreation, Unroaded Motorized w/o 4x4 (RE2A), Dispersed Recreation, Unroaded Motorized w/4x4 (RE2B), Special Interest Area Scenic (SI1), Scenic Travel-Retention (ST1), and Scenic Travel-Partial Retention (ST2). The total acres that occur within each Wenatchee Forest Plan land management allocation and their location are shown in Table I-3, below and Map I-4, Appendix A.

Table I-3 – Wenatchee Forest Plan Land Management Allocations within the Swauk Allotment (Acres)					
GF	**RE2A**	**RE2B**	**SI1**	**ST1**	**ST2**
33,368	2,334	17	267	6,221	2,765

Inventoried Roadless Areas within the Swauk AMP analysis area include Devil's Gulch, Lion Rock, and Teanaway. The total acres that occur within each Roadless area and their location are shown in Table I-4, below and Map I-5, Appendix A.

Table I-4 – Inventoried Roadless Areas within the Swauk Allotment (acres)	
Roadless Area	**Acres**
Devil's Gulch	302
Lion Rock	2,389
Teanaway	2,985
Total Roadless Area	5,676

Proposed Wilderness Areas within the Swauk AMP analysis area include Lion Rock and Teanaway. The total aces that occur within each Proposed Wilderness Area and their location are shown in Table I-5, below and Map I-6, Appendix A.

Table I-5 –Proposed Wilderness Areas (PWAs) within the Swauk Allotment (acres)	
Proposed Wilderness Area	**Acres**
Lion Rock	3,613
Teanaway	2,339
Total PWAs	5,952

Applicable Forest Plan Standards and Guidelines
A detailed description of the following applicable standards and guidelines is located in Appendix B of this document.

Forest Plan standards and guidelines applicable to the Swauk Allotment Management Plan Environmental Analysis come from the Wenatchee National Forest Land and Resource Management Plan (1990) as amended by the Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl and Standards and Guidelines for Management of Habitat of Late-Successional and Old-Growth Related Species Within the Range of the Northern Spotted Owl (1994; as amended) and the Record of Decision and Final Environmental Impact Statement for the Pacific Northwest Region Invasive Plant Program; Preventing and Managing Invasive Plants (2005).

Late-Successional Reserves
Standards and guidelines prohibit and regulate activities in Late-Successional Reserves that retard or prevent attainment of reserve objectives to maintain and develop late-successional and old growth plant communities. Where these objectives cannot be met, grazing practices must be adjusted. If adjusting practices is not effective, grazing must be eliminated.

Riparian Reserves and Riparian Areas
The Swauk Watershed Analysis was completed on the watershed in 1997. The Swauk is not identified as a Key Watershed. Standards and guidelines also prohibit and regulate activities in Riparian Reserves that retard or prevent attainment of Aquatic Conservation Strategy Objectives. The Aquatic Conservation Strategy (ACS) was developed to maintain and restore the ecological health of watersheds and aquatic ecosystems. Consistency with the ACS requires that management activities maintain acceptable conditions and do not retard or prevent attainment of the objectives. Further, forest plan standards and guidelines regulate activities in riparian areas with respect to sediment, temperature and vegetation. Riparian areas are to be managed for fish habitat, water quality and riparian associated wildlife habitat. Again, where these objectives cannot be met, grazing practices must be adjusted. If adjusting practices is not effective, grazing must be eliminated. Based upon riparian reserve designation in the Swauk Watershed Analysis, past projects within the project area and field reconnaissance, the interim riparian reserve widths will apply.

Soil
Standards and guidelines prohibit and regulate detrimental soil conditions and activities known to result in reduced site-productivity or loss of productive land surface. Standards and guidelines further require that sites degraded by grazing practices be rehabilitated.

Forage
Range management standards and guidelines dictate that forage utilization by livestock follow established allowable use guides, adjusting percent use up or down to meet total resource needs.

Invasive Species
Invasive species standards and guidelines require the prevention of invasive plant introduction, establishment and spread. The standards require the use of all available administrative mechanisms to incorporate invasive plant prevention practices into rangeland management.

Other Applicable Management Guidance

Relevant resource information and management guidance from the following documents was utilized in the development of the proposed alternatives. The documents identified below provide information pertinent to this analysis in terms of a larger scale assessment of the landscape (i.e., 5th-field watersheds and Late Successional Reserves). In this respect, these documents were utilized to identify areas of concern, establish a desired future condition and identify opportunities for moving the watershed toward the improved ecological condition. These documents are hereby incorporated by reference.

- Wenatchee National Forest, Late-Successional Reserve and Managed Late-Successional Area Assessment (U.S.D.A. Forest Service, Wenatchee National Forest 1997). The entire allotment is located within the Swauk LSR. Consistent with the management plan, emphasis for management over the last 15 years has been on the creation and maintenance of late-successional forest habitats.

- Swauk Watershed Assessment (U.S.D.A. Forest Service, Wenatchee National Forest 1997a).

    - Reduce the proportion of introduced non-native plant species by preventing their spread and establishment from management activities such as livestock grazing.
    - Reduce soil compaction risk from disturbance related to mining, recreation, grazing, logging and roads.
    - Increase incorporation of organics in the surface soil layer and mineral soil horizons. Increase retention of moisture in surface soils by increasing the distribution of course organic debris.
    - Maintain or restore healthy, functioning riparian zones.
    - Areas that are slumpy in nature will be avoided or carefully managed with respect to road management activities, grazing, harvesting, and recreation.
    - Maintain sufficient riparian vegetation composed of both conifer and hardwood species to provide summer and winter thermal cover for riparian-dependent species.

Significant Issues Associated with the Proposed Action

Although some preliminary concerns associated with this project were identified by management, the interdisciplinary team, permittees, and public involvement through the scoping process; no significant issues (those determined to influence the development of alternatives) were identified. Preliminary concerns are displayed below.

1. **Riparian Health and Fisheries**. Livestock grazing can affect riparian and aquatic ecosystems by physically removing and trampling associated vegetation causing changes in plant community composition and structure, the amount of ground cover and shade present, and overall species vigor. Continued removal of vegetation through grazing can ultimately result in the reduction or complete elimination of desirable species from the community (i.e., aspen and willow). These effects, in combination with the direct effects of trampling, can result in channel widening, unstable streambanks, streambank erosion, sedimentation and increases in summer water temperatures. The effects of trampling in meadows and wetlands adjacent to riparian areas can result in severe soil compaction and adverse hydrologic impacts. These effects further result in a reduction in water quality and properly functioning habitat for fish and other species dependent on aquatic and riparian habitat. The specific concern identified related to the implementation of this proposal was the effect of authorizing sheep grazing on water and water quality as related to steelhead, steelhead critical habitat, and Essential Fish Habitat for spring Chinook and coho.

   The potential short and long-term effect of each alternative on the following habitat criteria will be assessed in determining whether an alternative effectively addresses concerns relative to riparian and aquatic health: streambank condition, width to depth ratio, off-channel habitat, ground cover, soil compaction, soil erosion, sedimentation, plant species composition, structural diversity and water temperature.

2. **a. Terrestrial Ecosystem Health-Sustainability**. Livestock can affect upland ecosystems through grazing and trampling of vegetation which can result in a reduction in the ground cover that is present, soil exposure, and a subsequent increase in surface erosion on steeper slopes. Further, sites with exposed soil and active erosion are particularly vulnerable to the establishment of invasive and undesirable vegetation. Continued use of these areas further reduces their productivity and ultimately, the site-potential of the area. In addition to the effects described above, selective grazing of terrestrial plant species can affect the growth, vigor and abundance of preferred shrubs and forbs. Over the long-term, this can contribute to a reduction in the overall biodiversity of the plant community and further encourage the establishment of invasive and undesirable vegetation. Of specific concern related to implementation of this proposal are the potential effects of authorizing sheep grazing on soil and site-productivity, vegetative condition (including proposed, endangered, threatened plants and

special status and other rare and uncommon plant species), and the increased potential for establishment and/or spread of invasive species.

The following criteria will be assessed in determining whether an alternative effectively addresses concerns relative to terrestrial/upland health: soil erosion potential, soil compaction potential, percent ground cover present, plant species composition, plant vigor, and invasive species occurrence.

b. Terrestrial Ecosystem Health-Available Forage/Forage Quantity.
Available forage is the amount of annual forage production that is allocated to permitted livestock. Current management guidelines (U.S.D.A. Forest Service Wenatchee National Forest 1990) provide for a range of 30 to 50 percent of the annual forage production being available for grazing ungulates, including permitted livestock, with the remaining 60 percent annual production allocated to other watershed values (e.g., soil protection, water quality, etc.). Forage production must be adequate to provide for watershed related values, while also sustaining livestock grazing. The total forage produced, in combination with the allowable utilization value (standard and guideline), and livestock utilization requirements (lbs/pair) determine the total usable forage or animal months. The total usable forage (animal months) determines the number of permitted livestock and grazing season authorized for a given allotment.

Over time, reductions in the number of acres of timber harvested and large-scale wildfire events have resulted in the development of forested plant communities that support denser overstory canopies and consequently, less productive and diverse understories due to shading. In addition, longer fire-free intervals, in combination with the effects of long-term grazing have resulted in tree encroachment into adjacent shrublands, grasslands, and meadows, contributing further to increases in overstory density and subsequent decreases in the shrub, forb, and grass production associated with non-forested plant communities. Of specific concern related to implementation of this proposal is the availability of adequate forage to support domestic livestock grazing over time, while sustaining properly functioning ecosystem processes.

The following criteria will be assessed in determining whether an alternative effectively addresses concerns relative to terrestrial/upland health: - available forage/forage quantity and plant productivity.

3. Rangeland Resources – Loss of Social and Economic Values
The rangeland resource is important to individual livelihoods as well as societal and economic development. A permittee's economic life is often tied to the production of market goods such as that derived from grazing of livestock on National Forest administered lands. Public land permittees contribute to the local tax base, providing employment and patronizing local businesses. Additionally, livestock grazing is a long-standing traditional use of public lands. The specific

concern identified related to the decision to authorize or not authorize grazing was the potential adverse economic impact to local permittees and a reduction in value to the local, regional and national livestock industry.

The following criteria will be assessed in determining whether an alternative effectively addresses concerns relative to the loss of social and economic values: the number of livestock (cow/calf or ewe/lamb pair) and the season of use (days).

Preliminary concerns relative to riparian health and fisheries and terrestrial ecosystem health were addressed by applying project design criteria and best management practices to mitigate the potential for the proposal to result in adverse impacts to those specific resources. Additionally, the actions proposed under the adaptive management strategy, provide for a rapid management response to adjust practices should unanticipated impacts result. Concerns associate with the rangeland resource were also mitigated by the application of design criteria and best management practices. Utilizing these actions to develop alternatives which avoid and/or prevent the occurrence of unacceptable impacts allows the opportunity for the permittee to continue to feasibly operate the existing livestock operation.

Other Concerns Identified

Concerns related to the effects of authorizing livestock grazing on the following resources were identified during project scoping but were not considered as issues due to the development of design criteria, best management practices or mitigation measures that minimize or eliminate the potential for adverse effects. Common features were incorporated directly into the design of all grazing alternatives effectively reducing or eliminating the concern of adverse impacts on the identified resource.

- Proposed, Endangered and Threatened Animal species
- Special Status and other Rare and Uncommon Animal species
- Management Indicator Species
- Late-Successional Reserves and Managed Late-Successional Areas
- Heritage Resources
- Recreational Experience

Decisions to be Made Based on This Analysis

Based on the analysis documented by this environmental analysis, the Okanogan-Wenatchee National Forest Supervisor, Rebecca Lockett Heath, will make the following decisions:

- Whether or not to authorize continued grazing on the Swauk Sheep Allotment, and if so:

- How should grazing be managed to comply with standards and guidelines of existing land management plans, specifically, the class of livestock, the number of livestock, the appropriate season of use, structural and/or non-structural development requirements, measures required to maintain or improve existing resource conditions, and monitoring requirements necessary to determine if management direction is being implemented and if it is effective?

Scoping Summary and Public Involvement

The Swauk AMP project was initiated and the Interdisciplinary Team was assigned to the project May 21, 2007. The team consisted of specialists in rangeland management, plant ecology/botany, soil, water, fisheries, wildlife biology, heritage resources and recreation management. The internal scoping process began by reviewing the existing condition statements prepared by team specialists. A government-to-government letter was sent to the Yakama Nation on April 21, 2008; the Tribe raised no concerns relating to the project. Formal public involvement for the project was initiated on April 21, 2008, when a description of the proposed action was mailed to individuals, organizations and Federal, State and County agencies thought to have an interest in the project. An interdisciplinary approach was utilized to identify significant issues and consider alternatives presented by resource specialists, public response and management. The public comment period was on-going throughout the environmental analysis process. One e-mail response and one telephone response were received during the initial scoping (April 21-May 21). By utilizing information gleaned throughout the scoping process, the IDT was able to identify significant issues and formulate alternatives to the proposed action. The project was also identified in the Schedule of Proposed Actions (SOPA) for the Okanogan-Wenatchee National Forest beginning the 1st quarter (January-March) of 2008. The SOPA is mailed to a variety of individuals, groups and government agencies, and is also available for public viewing on the Forest website. Controversy relative to this project was not evident at any time during the scoping process. Chapters IV and V include additional information relative to public scoping contacts and input received.

Document Organization

This document follows the format and content established at 36 CFR 220.7(b). This environmental analysis document consists of the following main chapters:

- **Chapter I – Purpose of and Need for the Action:** Describes the proposed action, purpose of and need for action, project area, decisions to be made, scoping and public involvement and significant issues associated with the proposal.

- **Chapter II – The Alternatives Considered:** Describes the proposed action and alternatives to the proposed action. This chapter compares how effective each alternative is in addressing the significant issues.

- **Chapter III – Affected Environment and Environmental Consequences:** Describes how the present condition of the environment, relative to significant issues, could potentially be affected by the proposed action and alternatives to the proposed action, and how well the purpose and need for action is met.

- **Chapter IV – Agencies and Persons Consulted:** Includes a list of all agencies consulted on this project and any people or organizations who expressed interest in the project.

- **Chapter V: The Public's Involvement:** Includes a summary of the public involvement process and identifies persons and agencies consulted. Copies of letters received, and any responses, are included in the analysis file.

- **Chapter VI: References Cited**

Chapter II

The Alternatives Considered

Introduction

This chapter describes the process used to develop alternatives, including the proposed action. Alternatives selected for analysis are described, differences between alternatives are defined, and environmental impacts of these alternatives are summarized. The analysis of the no action alternative measures the existing condition for the issues considered, provides a baseline for comparison with the other alternatives, and is considered on the same basis as all action alternatives. A summary matrix table of environmental consequences is presented for issue indicator measures used in the analysis. Alternatives considered but not analyzed in detail are also presented in this chapter. The proposed action identified herein is the action alternative developed for public scoping purposes and analysis. It is not to be confused with the action that is selected in the decision document (the preferred alternative) once public scoping is complete and a full range of alternatives have been developed and analyzed.

Process Used to Develop the Alternatives

The proposed action was developed by an interdisciplinary team (IDT) through a process that identified existing resource issues, inconsistencies with established standards and guidelines and foreseeable future conflicts associated with the current management of domestic livestock grazing on the Swauk Sheep Allotment. The IDT considered existing laws and regulations, policy requirements, agency directives, current land and resource management plans, and environmental protection and species recovery plans to define problems and opportunities associated with continued livestock grazing on these allotments. Principle cause-effect relationships were identified to describe why the problem exists and to suggest possibilities for developing alternative solutions to resolving the problem. Alternatives to the proposed action were brought forth by the interdisciplinary team and through scoping of interested publics, State and Federal agencies and the range permittee. Alternatives brought forward were first examined to assess feasibility and to determine whether they fell within the scope of the project. A set of alternatives, which includes the proposed action and the no action, were selected for detailed analysis.

Alternatives Considered but Eliminated from Further Analysis

There were no alternatives considered but eliminated from further analysis.

Alternatives Selected for Analysis

The alternatives selected for analysis were developed in response to scoping and represent a reasonable array of options for management that provide for an appropriate level of domestic livestock grazing as set forth in the Wenatchee National Forest Land and Resource Management Plan (1990) and insures that authorized grazing complies with applicable Federal environmental laws, regulation and Forest Service policy.

The adaptive management alternative proposes to authorize continued livestock grazing by providing for modifications to the current management scenario (the proposed action) that are intended to address multiple resource objectives. This alternative provides for an array of management strategies to be used over time, as needed. This alternative not only addresses changes in the availability of existing transitory range, but also addresses previously unidentified resource issues associated with soil, water and fisheries, plant and animal species of special concern, special and unique habitats, invasive species and, cultural properties. The analysis also includes a no grazing alternative. The no grazing alternative is intended to display the consequences associated with not re-authorizing grazing on these allotments. Each of the alternatives analyzed are described in detail below.

The Alternatives Considered

Alternative 1 –No Grazing (No Action).
Under the No grazing Alternative (Alternative 1), grazing would not occur on the Swauk allotment under analysis. Under this alternative, grazing would not be authorized on the allotment and existing authorized domestic sheep grazing and actions associated with that livestock grazing (refer to Alternative 2- The Current Management Scenario) would be eliminated. The permittee would be given two (2) years written advance notice of the cancellation of their permit as provided for under 36 CFR 222.4(a)(1).

Alternative 2 – Current Management Scenario.
This alternative assesses the present condition of the affected environment and serves as a basis of comparison for the other alternatives analyzed.

A substantial effort to resolve known issues associated with livestock grazing has been on-going on the Swauk allotment since 1999 when considerable effort was put into the identification and resolution of resource related issues; primarily assocated with soil, water, and fisheries. Through this effort each individual bedground was assessed and relocated or eliminated if determined to be inconsistent with a set of criteria established to mitigate potential adverse impacts to soil and water. Further, routing was modified to avoid known sensitive areas, accommodate on-going restoration efforts, and avoid mining hazards. Approximately 20 bedgrounds were either relocated or eliminated completely, the majority of them in the vicinity of Lion Gulch, Cougar Gulch, Iron Creek, Williams Creek and Blue Creek. The modifications described above have been

incorporated into the Annaul Operating Instructions and have therefore been adopted as the current management practices.

Under the existing management scenario one band of ewes with lambs graze on the Swauk allotment, annually. The Swauk Allotment is managed independently of the other allotments.

Season of Use	Days	Authorized Ewe/Lamb Pair
June 10 – September 10	93	1000

There are no improvements or developments known to exist on this allotment.

With respect to routing, livestock are unloaded at the Liberty Heliport (T20N., R17E. Section 2) and travel easterly across Williams Creek into the Boulder Creek drainage (T20N., R17E. and R18E.). The band then moves northward and west crossing from T20N., R18E. Section 6 (Snowshoe Ridge) to Cougar Gulch and through T21N., R17E. Sections 36 and 25. The route continues in a northeast direction through T21N., R18E. Sections 30, 19, 20, 17, and 16 in the direction of Swauk Meadows in Section 9. The route then travels west into Section 8 and crosses Hwy 97 in the upper portion of Section 8, in the vicinity of the Old Swauk Lodge site. The band moves upslope and grazes west along the ridgetops through Sections 5 and 6 of T21N., R18E. and Sections 1, 12, 11 and 10 of T21N R17E. into lower Iron Creek. The route trails up Hovey Creek and crosses Sections 9 and 16 in a southwest direction onto the Blue Creek road system. The route continues along Forest Road 9738 in a northwesterly direction through Sections 17, 8 and 7 of T21N., R17E. From this location, the band travels south along Teanaway Ridge past Red Top Lookout and out of the analysis area. The route continues through T21N., R16E. Sections 12, 13, 25 and T21N., R17E. Sections 18, 19, 30, 31, 32, and 33 until crossing Highway 97 in the vicinity of Liberty Guard Station in Section 3 of T20N., R17E and returning to the heliport. Bedding areas occur at various locations along the described route where sheep are authorized to stay one or two nights at each location depending on the specific bedground. Bedgrounds are typically located on existing hardened sites such as old landings, or previously established dispersed campsites. Refer to Map II-1, Appendix A, Alternative 2 – Current Management Scenario.

Design Criteria and Best Management Practices
The following measures are part of the existing AMP to minimize or avoid potential adverse impacts resulting from domestic livestock grazing, as described here, and are also common to the proposed action.

1. Livestock entry onto the allotment is not permitted until such time as soils are dry enough to prevent damage and the key plant species are ready to withstand grazing. The identified season of use is a general guide, the actual turn-out dates are determined by development of forage indicator species and soil moisture. The number of beds and period of time spent in an area is dependent on the available forage present and the utilization of that forage. If utilization standards are reached prior to all beds/nights

being utilized, or resource conditions warrant, livestock removal is based on these factors rather than on the planned season of use dates.

2. Designated primary key travel routes, bedding grounds, and camp locations are identified on a map prior to sheep arriving on the allotment. Secondary routes are designated annually and also identified on the map. This map/schedule is considered as part of the Annual Operating Instructions for the allotment. The key travel routes are designated to represent the overall general direction of movement through an allotment over the established season of use. The intent of the key route concept is to provide for variation in the specific locations grazed annually along the route. The intention is to prevent repeated grazing of the same areas. The camp unit location shown on the routing plan and map indicate the authorized camp location. The Forest Service Administrator has the authority to require the associated bedding grounds be bypassed or restrict the number of days a camp is used. This decision is based on previous use and the sites current condition.

3. A herder accompanies the sheep band while on the allotment. Dogs are used to enhance herding and gathering strategies.

4. It is the permittee's responsibility to ensure sheep are grazing within the utilization standards outlined in the Forest Plan. The Forest Service Administrator periodically verifies permittee compliance with these standards. Areas found to be in unsatisfactory condition or with utilization in excess of Forest Plan Standards are eliminated from further use for that season and future use of the area may be restricted. Utilization standards are set for riparian areas, uplands/forested areas, and reforestation units. When allowable use (Forest Plan Standards) has been reached in an area, the sheep are required to move. Utilization measurements and monitoring by the Forest Service Administrator targets those areas identified on the allotment maps as key use or sensitive resource areas. Other areas are monitored as necessary.

MAXIMUM ANNUAL PERCENT UTILIZATION ALLOWED		
RIPARIAN AREAS	**When in Satisfactory Condition**	**When in Unsatisfactory Condition**
Grass and Grass-like forage	40%	0-30%
Shrubs	30%	0-25%
UPLANDS/FORESTED AREAS	**When in Satisfactory Condition**	**When in Unsatisfactory Condition**
Reforestation Units	40%	0-30%
Forest	40%	0-30%
Grasslands	50%	0-30%
Grass and Grass-like forage	40%	0-25%

5. Shrub utilization is based on incidence of use, twig weight, and/or twig length.

6. In addition to utilization monitoring, the condition of the grazed area and associated bedgrounds are also assessed. Areas that are determined to be unsatisfactory may be eliminated from futher use.

7. Bedding grounds and campsites are located according to the following established set of criteria.

- Campsites and bedding grounds will be located on previously hardened sites such as landings, gravel pits, and established dispersed campsites, when available. Once hardened sites have been identified, approved, and located on a map, annual re-authorization of these key campsites and bedding grounds is not required. Authorized bedgrounds may be identified on the ground using a bedground designator. When hardened sites are not available bedding grounds will be located according to the established criteria. Secondary campsites and bedding grounds will be authorized prior to use.

- When bedding grounds must be established in other than previously hardened locations, they will be located on low erosion hazard class sites and away from sensitive areas such as riparian reserves, natural meadows, soils supporting cryptogammic crusts, Proposed, Endangered, Threatened and Sensitive plants and animals, Special Status plants and animals, cultural resource sites or invasive species "hotspots". In addition, bedgrounds will not be located in developed recreation sites, semi-developed (i.e., with facilities such as toilets and kiosks) heavily used dispersed campsites, at trailheads or within mine claims. Additionally, bedding and trailing may be restricted at other locations as specified annually as needed.

- Camping within 100 feet of system trails and four-wheel driveways will be avoided whenever possible.

- The maximum slope for bedding grounds will be 30 percent.

- Loose herd trailing will be employed to and from bedding grounds to promote livestock dispersal and minimize adverse impacts to soil and vegetation in the vicinity of the bedding ground.

- The maximum stay at any given bedding ground will be two nights unless otherwise pre-approved by the range administrator on a case-by-case basis. The Range Administrator retains the right to require campsites and bedding grounds be bypassed or restricted in the number of nights they may be used. This decision will be based on the previous use and current condition of each site.

- Every reasonable effort will be made to insure bedding grounds are not located within a Riparian Reserve as described on Page C-30 of the Northwest Forest

Plan ROD Description-Riparian Reserve Widths. Riparian Reserve widths are specified for streams or waterbodies as follows:

- fish-bearing streams, lakes and natural ponds - 300 feet;
- permanently flowing non-fish-bearing streams - 150 feet;
- constructed ponds, reservoirs, and wetlands greater than 1 acre - 150 feet;
- seasonally flowing or intermittent streams and wetlands less than acre - 100 feet.

- If a bedding ground must be located within the Riparian Reserve:
  - The bedding ground will be located where sediment is unlikely to be transported to a stream and access to the stream by livestock will not retard attainment of the Aquatic Conservation Strategy.
  - The site will meet Wenatchee Forest Plan Riparian Vegetation Standards (IV-88). These standards are a minimum of 90 percent ground cover provided by trees, shrubs, grasses, sedges, and duff within the floodplain/true riparian zone.
  - The maximum slope a bedding ground will be located on is 10 percent.
  - The site must be hardened or where bedrock is close to the surface.
  - No salting will occur within the Riparian Reserve.
  - Corralling of livestock for loading and shipping will not occur within the riparian reserve.

- Livestock will not be authorized to bed or "noon" in meadows, wetlands, or riparian areas or on roads or trails. Grazing within allowable standards (utilization and condition) is allowed in meadows and riparian areas.

8. Streamside access points and crossings will be identified and where necessary, hardened to minimize sediment delivery and adverse impacts to streambanks. In the event access to water is not practical, the permittee will pump water using approved equipment from authorized water chances and/or haul water to troughs set up at pre-designated locations.

9. Sheep are to be kept from concentrating in riparian areas, key meadow areas, and in plantations less than 3 feet tall. When the band is feeding or trailing along the main road, trails or driveways during the mid-day, they are not to bed down or "noon" on the road or trail. It is required that sheep be moved off the road or trail so as to leave it open for motor vehicles, hikers, or horsemen to pass.

10. Routing and bedding is not authorized in the vicinity of identified watershed restoration projects. Range management will coordinate routing activities such that grazing will not conflict with/or inhibit the success of these projects. Areas that require avoidance would be identified on the map included in the Annual Operating Instructions. The Range Administrator or other specialist will also mark or otherwise identify these areas on the ground to ensure that the permittee is aware of the location.

11. Grazing, overnight bedding, and stream crossings in or along Iron Creek will be avoided due to watershed restoration efforts for native populations of threatened bull trout and steelhead throughout the watershed. Consultation between the US Forest Service, US Fish and Wildlife Service and National Marine Fisheries Service in 1999 resulted in specific agreed upon conservation measures for bull trout and steelhead habitat. The purpose of these conservation measures is to minimize sediment delivery into waterbodies and other adverse effects to the aquatic system.

12. Sheep are to be salted on or near the bedding grounds except in the unusual case where a bedding ground must be located in a riparian reserve. Salt must be placed in trays or pans to avoid potential adverse impacts to other resources. All salt must be placed away from available water, meadows, reforested plantations where trees are less than five feet tall, established campsites or visually sensitive areas. It is prefered that salt be located on hardened sites such as landings, closed spur roads or old borrow pit sites. Salt must be moved as bedgrounds and camps are relocated. It is required that all salt not consumed by livestock be removed from the site. All salting locations will be approved by the Range Administrator before initial placement or movement.

13. There is no trailing, grazing or bedding of livestock in designated Proposed, Endangered, Threatened, or Special Status Species plant locations, unless otherwise designated. These areas will be identified on the routing map in the Annual Operating Instructions.

14. If any plants or animals listed as proposed, endangered, threatened, or special status species are located at any point in time prior to or during implementation of this activity, they will be managed according to all relative laws and regulations, their respective conservation plans, agency policy, directives, handbooks, manuals, applicable standards and guidelines, current scientific literature and other pertinent information.

15. The Record of Decision for the Pacific Northwest Region Invasive Plant Program: Preventing and Managing Invasive Plants (2005) standards will be implemented through implementation of the Okanogan-Wenatchee National Forests Noxious Weed Prevention Strategy and Best Management Practices (BMPs) (2002). Applicable BMPs include:

- Develop weed ID and mapping program for permittee.
- Discuss weed prevention practices and control measures at annual operator meetings and include in Annual Operating Instructions. Items to be addressed in plan may include: minimizing ground disturbance, weed seed transportation, maintaining healthy vegetation, control methods, revegetation, monitoring, reporting and education.
- Encourage incidental pulling of noxious weeds.
- Revegetate bare soil from grazing activities. Use only weed-free plant materials and mulch for revegetation and site stabilization. Use native material where appropriate. Non-native materials may be appropriate and considered in the following situations: to protect basic resource values (site productivity by

reducing soil erosion), 2) as an interim, nonpersistent measure designed to aid in the re-establishment of native plants, or 3) local native plant species are not available. Monitor and evaluate success of revegetation efforts.

- Check areas of concentrated livestock use for weed establishment. Plan for treatment of new infestations.
- Armor constantly disturbed areas such as at road/stream crossings.
- Avoid driving vehicles through off-road weed infestations.
- Clean all off road equipment prior to entering the project site.
- Use weed-free feed or weed-seed-free hay or straw in permitted areas.
- Exclude livestock from sites with new invaders or eliminate new invaders in these areas before entry by livestock.
- Feed weed-free feed to livestock for several days prior to moving them onto the allotment to reduce the introduction of new invaders and spread of existing weed species. Consider using transitional pastures when moving animals from weed infested areas.
- Manage forage utilization to maintain the vigor of desirable plant species as described in the Wenatchee Forest Plan utilization standards.
- Minimize and/or exclude grazing on restoration areas until vegetation is well established.
- Allow grazing in burned areas only after judged ready for use by a range and vegetation specialist.

16. All National Register of Historic Places (NRHP) listed, eligible and potentially eligible properties will be reasonably buffered in relation to their individual protection needs, and marked for avoidance. Activities determined by an archaeologist to have little or no potential to affect a specific property will be allowed to occur within marked boundaries.

17. Periodic monitoring of heritage properties and landforms within activity areas of high to moderate archaeological sensitivity will be conducted concurrent with activity implementation. Protection and/or mitigation needs for known or newly discovered properties will be updated or identified as appropriate. Additional NEPA documentation would be completed, as required.

18. If a newly identified property could not be avoided or protected from project activity, appropriate mitigation measures will be satisfied in coordination with the State Historic Preservation Officer and Advisory Council for Historic Preservation, prior to resumption of that activity. Additional NEPA documentation would be completed, as required.

19. No grazing or trailing of sheep is allowed in Forest Service developed campgrounds, recreational sites, or near any Forest Service water systems (unless authorized by the Range Administrator). Make every attempt to route around, rather than through these areas. It is the permittees responsibility to ensure sheep do not linger in these areas. Obvious dispersed camp sites are to be avoided by at least 200 yards. In the event livestock would be in the vicinity of these areas, public notification would be made to

inform potential forest visitors that livestock may be in the area. Recreational trails are to be crossed at right angles to the trail.

- The Red Top parking area and the area around the Red Top agate beds would be avoided to mitigate potential conflicts with recreational use at the agate beds.

20. Grazing is permissible on mining claims, but active mining operations are to be avoided. If movement of livestock across active mining is necessary, it must be coordinated with the mine operator.

21. The permit holder is responsible for adhering to all fire precautions and regulations.

22. The permit holder is responsible for ensuring a safe crossing of Hwy 97. The permitte will implement safety criteria established by the Washington Department of Transportation and conform with all applicable State requirements.

23. Provisions for Grizzly Bear: The following measures will be implemented to minimize the potential for adverse human-bear encounters within the Recovery Zone:

- All camps will be left in clean condition.
- All food, garbage, and livestock feed will be stored in vehicles, bear-proof containers, or hung on lines strung between trees and out of reach from bears (i.e., line strung between trees at least 20 feet apart, and high enough to raise food at least 15 ft off the ground). Trash will be packed out and disposed of off-forest, at approved county transfer facilities.
- All sheep carcasses will be physically removed and disposed of off-forest as soon as they are discovered. If a horse is used (to herd sheep) and dies, its carcass will be dismembered and physically removed and buried at a location that is at least ¼ mi away from any road, trail, developed or dispersed campsite, or active mining claim. An alternative would be to blow up the carcass into pieces too small too attact bears.
- All negative encounters with bears (either black or grizzly), canids, or other carnivores will be promptly reported to the Range Admistrator, who will inform the District Biologist. The district may respond with additional monitoring and/or signing to inform the general public.
- Predator control is not authorized under the terms of this permit. If bear predation on sheep occurs, the permittee will immediately notify the Range Administrator, who will inform the District Ranger and District Wildlife Biologist. The district, in cooperation with the Washington Department of Fish and Wildlife and the U.S. Fish and Wildlife Service, will follow Interagency Grizzly Bear Guidelines (1986) in regard to authenticating kills, classification of nuisance bears, and removal of bears.
- Most of the Swauk sheep allotment falls within grizzly bear management situation 2, where the management objective is to maintain or improve habitat for grizzly bears, and to minimize the potential for grizzly-human conflicts. Therefore, the grazing permit will include a clause calling for temporary cessation of grazing activities, if needed to resolve a grizzly-

human conflict. Permittees full cooperation in meeting grizzly management goals and objectives will be a condition to their receiving and holding the grazing permit (IA Grizzly Bear Guidelines, pp. 28).

- Some parts of the allotment (NF system lands around Liberty, and the Liberty Mountain home development) are mapped as grizzly bear management situation 3, where grizzly bear presence would be actively discouraged. There is still an emphasis, however, on minimizing grizzly-human conflicts, therefore the AMP will include all measures listed above for all areas for the timely removal, destruction, or treatment of livestock carcasses, and for making all human food and garbage, livestock feed, and pet food unavailable to bears.

24. Provisions for Gray Wolf: The project area encompasses habitat that is potentially occupied by gray wolves, although presence of a breeding population has not been established. In January 2007, the U.S. Fish and Wildlife Service (FWS), Washington Department of Fish and Wildlife (WDFW), and U.S. Department of Agriculture Wildlife Services (U.S.D.A./APHIS) released guidelines for response to situations involving wolves in the state of Washington, including reports of livestock depredation by wolves and reports of dead or injured wolves. In accordance with these guidelines, control of wolves is not authorized under this permit.

- If wolf depredation on sheep is suspected, the permittee will immediately secure the scene and notify the Range Administrator, who will inform the District Ranger, District Wildlife Biologist, and APHIS. If wolf depredation is confirmed, the Forest Service (as land manager) will coordinate with the 3 other agencies to plan possible followup actions.
- If a dead or injured wolf is encountered by the permittee, the permittee will secure the scene and immediately inform the Range Administrator, who will inform the District Ranger and District Wildlife Biologist. USFWS and/or WDFW law enforcement personnel will also be notified immediately, to investigate the scene and recommend any further actions.

25. Provisions for Canada Lynx: The LCAS lists standards for grazing in lynx habitat. These standards are listed below (in quotes), with an explanation (in *italics*) of how they will be implemented under this project:

- "Do not allow livestock use in openings created by fire or timber harvest that would delay successful regeneration of the shrub and tree components. Delay livestock use in post-fire and post-harvest created openings until successful regeneration of the shrub and tree components occurs" . *Sheep will be kept from concentrating in plantations and burned areas where the trees are less than three (3) feet tall.*
- "Manage grazing in aspen stands to ensure sprouting and sprout survival sufficient to perpetuate the long-term viability of the clones." *Aspen clones will be identified and sheep will be kept from concentrating in those areas. These areas will be monitored to ensure utilization standards are adequate to protect these resources.* If utilization standards are not adequate and cannot be adjusted

to eliminate impacts to aspen communities, grazing will be eliminated from the area. (ROD Page C-33)

- "Within the elevational ranges that encompass forested lynx habitat, shrub-steppe habitats should be considered as integral to the lynx habitat matrix and should be managed to maintain or achieve mid-seral or higher condition." *Shrub-steppe habitat will be identified and sheep will be kept from concentrating in those areas. These areas will be monitored to ensure utilization standards are adequate to protect these resources.* If utilization standards are not adequate and cannot be adjusted to eliminate impacts to shrub-steppe communities, grazing will be eliminated from the area. (ROD Page C-33)
- "Within lynx habitat, manage livestock grazing in riparian areas and willow stands to maintain or achieve mid-seral or higher condition to provide cover and forage for prey species." *Sheep will be kept from concentrating in riparian areas. These areas will be monitored to ensure utilization standards are adequate to protect these resources.* If utilization standards are not adequate and cannot be adjusted to eliminate impacts to riparian communities, grazing will be eliminated from the area. (ROD Page C-33)

Alternative 3 – Adaptive Management (Proposed Action).

This alternative utilizes an adaptive management strategy. An adaptive management strategy is when the alternative is developed to allow for flexibility during implementation of the action to respond to changing conditions and unexpected results. This type of proposal is particularly useful for large analysis areas, for areas where there are uncertainties regarding the effects of the proposal, and for areas where changing environmental conditions may affect implementation of the proposed activity over time. The strategy emphasizes short and long-term resource objectives and provides an array of management options that best meet or move toward the identified objective. In the context of this analysis, this means that a course of action is proposed that is expected to move the current condition toward the desired future condition. Monitoring and subsequent evaluation of results would occur over time to determine if adjustments in management are necessary to ensure adequate progress toward the defined objectives. All adaptive actions would be within the scope of the effects analysis documented in this environmental assessment. If proposed actions are outside of the scope of the effects analsyis contained herein, additional NEPA documentation and decision would be prepared, as appropriate. This alternative specifies the circumstances under which alternative options would be implemented in response to changing conditions or unanticipated results and the criteria and monitoring that would be used to identify those circumstances. Applicable standards and guidelines, best management practices, and design criteria are displayed above.

Alternative 3 (Adpative Management) does not propose any change from the current management sceanrio (Alternative 2) relative to season of use , authorized numbers, or routing.

Season of Use	Days	Authorized Ewe/Lamb Pair
June 10 – September 10	93	1000

Further, all design criteria and best management practices identified under the current management scenario also apply under this alternative.

As a result of the previous and on-going emphasis on resolving known issues and bringing the grazing activities on this allotment into compliance with forest plan standards, there is very little difference between Alternative 2 (the current management scenario) and Alternative 3 (Adaptive Management). Refer to Map II-2, Appendix A, Alternative 3 – Adaptive Management Scenario. However, Alternative 3 does provide an adaptive management component that is not provided under the current management scenario (Alternative 2). The adaptive management alternative (Alternative 3) would allow for flexibility to continue to resolve known issues and to address issues that could potentially arise but have not currently been identified as an existing problem. Items that would be addressed using an adaptive management approach include:

- Sensitive Plants: Management of recently identified sensitive plant populations through avoidance, rerouting and/or placement of a temporary barrier if it determined that these popultation are being adversely impacted.
- Revegetation at Williams Creek (T20N. R17E. Section 11): Successful revegeatation may not be occurring due to a concentration of animals at this location. Re-routing to avoid this area or placement of a temporary barrier may be necessary to resolve this issue.
- Revegetation at Pine Gulch (T20N. R17E. Section 11): Successful revegetation may not be occurring due to concentrated use on the slope between bedgrounds 2 and 3. A modification in the number of authorized nights at each bedground, rerouting and/or placement of a temporary barrier may be necessary to resolve this issue.
- Iron Creek alternative crossing (T21N. R17E. Section 10): An adaptive option to trailing livestock on Highway 97 in order to avoid crossing through Iron Creek would include trailing of livestock from the 7320 road system across and onto Forest Road 9714-601 and on to the lower portion of Forest Road 9714 for approximately one-half mile.
- Swauk campground water sysem (T21N. R17E. Section 12): Although substantial effort would be used to avoid the Swauk Campground, there is the potential for adverse impacts to the campground water system due to the proximity of a bedground to the spring box. There has not been, nor is there at the present time, any indication that there is a problem associated with this use. Re-routing or protection of the area through temporary barriers may be necessary to resolve this potential issue should it arise.

Monitoring is a primary component of Alternative 3 (Adaptive Management). Monitoring is necessary to confirm that implementation of the selected strategy is consistent with applicable standards and guidelines and contributing to meeting long-term resource objectives. The adaptive management strategy is intended to provide for the

ability to implement the actions identified above, as necessary over time. The following monitoring items would be required under the adaptive management approach.

- Monitoring would determine if adequate reestablishment of the vegetation at Williams Creek and Pine Gulch was occurring. Successful revegetation of these sites would be measured by vegetative cover and plant species composition.
- Sensitive plant populations would continue to be monitored to ensure that no adverse impacts result from domestic sheep grazing.
- The Iron Creek crossing would be monitored annually to ensure that livestock do not cross through Iron Creek and that trailing occurs as described above.
- If there are indications of adverse impacts to the Swauk Campground water system, on-site inspection and water sample data would trigger the need to reroute the livestock or place temporary barriers to protect an area.

Monitoring would also consist of regular inspections of the operation over the course of the grazing season. Inspection items include: range readiness monitoring prior to turn-out of livestock, forage utilization monitoring, and bedground and general routing compliance. Areas with the highest priority at this time include temperature monitoring in Swauk Creek, Iron Creek, and Williams Creek; all bedgrounds with proximity to riparian areas, routing near restoration treatments, particularly the area near Forest Road 601 in Iron Creek, the crossing at Williams Creek between bedgrounds 1 and 2, the crossing on Pine Gulch, Cougar Gulch area, and bedgrounds 12 and 13, utilization near bedgrounds 15 and 16, and in Lion Gulch, Hurley Creek and Dunning Meadows; and closures on roads near bedgrounds to ensure closures are maintained. These items, in combination with the standards and guidelines, would be used to determine when trigger points have been met or exceeded; and there is a need to consider a change from an existing management strategy.

Alternative Comparison

Table II-1 below, compares the effect of each alternative on the indicators for each concern identified previously.

Table II-1: Comparison of Alternatives by Preliminary Concern

Concern	Comparison Criteria	Alternative 1 (No Grazing)	Alternative 2 (Current)	Alternative 3 (Adaptive)
Riparian and Aquatic Health *As determined by:* Width to depth ratio Off-channel habitat Streambank condition Ground cover Soil compaction Soil erosion Sedimentation Plant species composition Canopy cover Sructural diversity	Protects Steelhead, Redband trout, and Westslope cutthroat trout	Completely protects	Maintains/No change from present	Slightly to Moderately protects
	Enhances or maintains aquatic and riparian habitat including Critical Habitat for steelhead and Essential Fish Habitat	Moderately enhances	Maintains/No change from present	Moderately enhances
Upland/Terrestrial Health *As determined by:* Soil erosion Soil compaction Ground cover Species composition Plant vigor Invasive species occurrence	Maintains or moves toward desirable vegetative conditions	Slightly or Moderately moves toward	Maintains/No change from present	Slightly moves toward
	Maintains or moves toward desirable soil conditions	Slightly or Moderately moves toward	Maintains/No change from present	Slightly moves toward
	Enhances or maintains special and unique habitats	Slightly or Moderately enhances	Maintains/No change from present	Maintains/ Slightly enhances
Sustainable Carrying Capacity *As determined by:* Plant productivity	Adequate forage available for proposed number of livestock and season of use	Not Applicable	Yes, adequate forage available	Yes, adequate forage available
Rangeland Resources – Loss of Social and Economic Values	Number of livestock	0 pair	1000 ewe/lamb pair	1000 ewe/lamb pair

Concern	Comparison Criteria	Alternative 1 (No Grazing)	Alternative 2 (Current)	Alternative 3 (Adaptive)
As determined by: ewe lamb pair Season of use (days)	Season of use	0 days	93 days	93 days
Meets Purpose and Need	-Provides for an appropriate level of continued livestock grazing based on adequate forage. -Authorized grazing complies with newly instituted LRMP standards	Does not meet the need for continued livestock grazing. Would not be inconsistent with new standards as no grazing would occur.	Meets the need for continued sustainable livestock grazing. Complies with applicable standards. Standards GM-1, GM-2 and GM-3 are being met through the adjustment of routing and bedgrounds away from riparian and other sensitive areas. Where ACS objectives could not be met grazing was eliminated (e.g., in Lion Gulch, Cougar Gulch, Iron Creek, Williams Creek and Blue Creek). Livestock handling/management facilities are few and temporary in nature. Design criteria dictates that they are not located within Riparian Reserves. Best management practices dictate that trailing, bedding, watering, loading, and other handling efforts are limited and minimize or avoid unacceptable impacts to water, soil, and vegetation resources. Alternative 3 (Adaptive) further provides for flexibility during implementation to respond to changing or unpredicted conditions (e.g., sensitive plants, revegetation efforts, water quality).	

Chapter III

Affected Environment and Environmental Consequences

Introduction

This chapter describes the affected environment and identifies the probable consequences relative to each previously identified resource issue of implementing the alternatives described in Chapter II – The Alternatives Considered. This chapter also forms the scientific basis for comparison between alternatives. Direct, indirect and cumulative effects are summarized and quantified for each indicator identified in Chapter I – Purpose and Need for Action. Mitigation measures required to achieve disclosed effects are identified in Chapter II.

Past, Present, and Reasonably Foreseeable Future Actions within the Project Area

The discussion of Environmental Effects in Chapter 3 later in this document has considered the Proposed Action and other action alternatives within the context of present and reasonably foreseeable actions that may occur in the project and surrounding area. The effects of past activities are represented in the baseline for each issue area consistent with the President's Council on Environmental Quality's Guidance on the Consideration of Past Actions in Cumulative Effects Analysis (June 24, 2005), which is hereby incorporated by reference. This guidance states that "Generally, agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historical details of individual past actions". Table I-6 below displays present and reasonably foreseeable actions within the Swauk Allotment Management Plan analysis area that may have overlapping effects with this grazing proposal.

Table I-6 – Present and Reasonably Foreseeable Future Actions within the Swauk Allotment Management Plan Analysis Area

Project/Survey	Description
Power line maintenance	Annual maintenance of the powerline includes clearing fallen trees, removing new undergrowth, and line maintenance within the corridor.
System trail maintenance	Annual trail maintenance occurs within the watershed. Typical maintenance activities include clearing, brushing, tread work, etc.
Iron Re-offer Timber Sale ongoing	Dry forest commercial thinning project, with pre-commercial thinning, underburning, road maintenance and decommissioning, and herbicide treatment of invasive species. 611 acres.
Orion SBA Timber Sale, on-going	Dry forest commercial thinning project, with pre-commercial thinning, underburning, road maintenance and decommissioning, and herbicide treatment of invasive species. 1204 acres.

Table I-6 – Present and Reasonably Foreseeable Future Actions within the Swauk Allotment Management Plan Analysis Area	
Project/Survey	**Description**
Liberty Timber Sale, on-going	Dry forest commercial thinning project, with pre-commercial thinning, underburning, road maintenance and decommissioning, and herbicide treatment of invasive species. 1276 acres.
Dispersed campsite riparian restoration	Annual maintenance to reestablish barriers as needed.
Fine sediment monitoring	McNeil Core Sample monitoring of fine sediment in the mainstem Swauk Creek from the confluence of First Creek to the confluence of Pipe Creek.
Mining	Year round and seasonal operations which include; blasting in existing mine tunnels, ore processing, portal reconstruction and access maintenance, hazard tree removal, waste rock disposal.
Road maintenance	Annual maintenance to reestablish road closures as needed.
Invasive species treatment	State-listed noxious weeds along most roadsides in the allotment are spot treated with herbicide
Forestwide Invasive Species Treatment EIS	Forestwide invasive species treatment through integrated weed management methods.

Riparian Health and Fisheries

Riparian Health Affected Environment

The majority of the Swauk Allotment is within the Swauk fifth field HUC watershed, with an additional small area in the Teanaway watershed at the headwaters of Jack Creek on the western boundary. Approximately 85% of the total allotment area is within the Swauk Creek watershed. Grazing is confided to the ridgelines and any impacts to streams in the Pashastin and Teanaway watersheds are so minimal as to be negligible and can not be discerned from baseline conditions, therefore aquatic impacts from this project will not be evaluated further in the Teanaway or Peshastin watersheds. Swauk Creek has a total watershed area of 63,892 acres and is tributary to the Yakima River, with its confluence located downstream of the Okanogan-Wenatchee National Forest boundary. Tributary watersheds to the mainstem Swauk Creek within the allotment include Iron Creek, Hovey Creek, Hurley Creek, Blue Creek, Medicine Creek, Baker Creek, Deer Gulch, and Williams Creek with Lion Gulch, Cougar Gulch, and Boulder Creek.

Watershed elevations within the analysis area range from a low of 2400 feet at the southern end of the analysis area, at the confluence of Williams and Swauk Creek, to a maximum of over 6300 feet along the eastern boundary near Lion Rock on Table Mountain. The headwaters of the Swauk watershed consist of the Teanaway Ridge to the west (5361 feet), Table Mountain to the east (6359 feet), and the Wenatchee Mountains to the north (5489 feet). The upper one third of the mainstem Swauk flows in a westerly direction before turning nearly due south at its confluence with Hovey Creek. The

watershed is dominated by forested hillslopes ranging from sparse to densely stocked stands, with valley bottoms and meadows vegetated by shrubs, hardwoods, forbs and sedges (U.S.D.A. Forest Service, Wenatchee National Forest 1997a). The nearest precipitation stations are Blewett Pass (4270 feet) located at the north edge of the analysis area, and Grouse Camp (5400 feet) located to the east along Table Mountain. Mean annual precipitation at the mouth of the planning area is approximately 20 inches, increasing to over 40 inches along the headwaters of Hovey and Iron Creeks. The majority of precipitation falls from October to May, in the form of snow. Warm maritime air masses moving west to east in early and late winter months can result in intense rainstorms over the area's snowpack. These storms are generally responsible for the largest peak discharges observed in the analysis area. Snow water equivalent (SWE), or inches of water in the snowpack, for the high elevation station averaged 10-15 inches during the peak rain-on-snow period of December through February. The annual range of SWE for both stations is a minimum of 0.3" in early November to a maximum of 19.8" on April 1st. Melt out of snowpack occurs on the average, by April 20th at the Blewett Pass station (U.S.D.A. Natural Resources Conservation Service 2006).

Geology and landtype associations have influenced the development of drainage patterns and influence the storage, routing and delivery of water to streams across the planning area. Soils in the analysis area are highly variable ranging from shallow, coarse textured, weakly developed soils along ridgetops to deep, fine textured, well developed soils along toe slopes and valley bottoms. Soils are mainly derived from two geologic parent materials, which include the Swauk Sandstone formation and the Columbia River Basalt formation. The weathering of the basalt formation and the weak contact between these two formations has resulted in extensive areas of ancient landslide deposits which are common within the analysis area. The folded sedimentary materials of the Swauk Sandstone formation, and landslide deposits, dominate the surface geology. The geomorphic terrain represented by the Swauk Sandstone formation has been described as "Structurally Controlled" terrain by Karrer in U.S.D.A. Forest Service, Wenatchee National Forest (1997a), while the landslide deposits are referred to as a "Mass Wasting" terrain. Each has different implications and interpretations relative to hydrology in the analysis area.

The Swauk Sandstone formation consists of interbeds of sandstone, shale and siltstones that have been folded into a pattern of steep dip and scarp slopes (>45%) producing v-shaped valleys. The terrain is characterized with high drainage density, steep slopes and relatively shallow soils. Drainage patterns are generally dendritic or rectangular. Dip slopes consisting of sandstone or siltstones overplayed on top of shale beds results in a more permeable stratum atop a less permeable confining layer. Uncompacted soils allow for rapid downward movement of water through the soil profile until it reaches the shale or confining bedrock layers, where it moves laterally until it emerges as surface flow, either as streambanks, scarp slopes or road cutslopes. Watershed responses include relatively low near surface water holding capacity, low regulation of streamflow, and flashy runoff. Localized seeps and springs are limited, yet occur primarily along valley toe slopes along bedrock geologic contact zones. Where scarp slopes occur along ridges,

exposing horizontal sedimentary bedding planes, permeability is relatively high, deep subsurface flow paths exist which diverts subsurface runoff.

Mass Wasting terrain units dominate the upper portion of Williams Creek subwatershed, including Lion Gulch. Other areas include lower Hurley Creek and localized areas in the lower Swauk subbasin. These landslide and earthflow formations exhibit hummocky terrain with deranged drainage patterns. Soils are generally thick unconsolidated materials alternating between highly permeable and loosely consolidated gravel/cobble to tightly consolidated areas of fine clays. Soils have moderate to high subsurface water holding/storage capacity. Seep, springs and ponds are common. Streamflow and surface runoff are well regulated and less flashy in response to storm events and runoff (U.S.D.A., Natural Resources Conservation Service 2006).

Water Quality-Stream Temperature

Water quality parameters (with a Washington State Water quality criteria) most likely impacted by grazing are water temperature, turbidity (stream sedimentation), and fecal bacteria. Water temperatures have been monitored over the past several years for the perennial streams within the Swauk Planning Area. Most of the sampled streams have exceeded the state temperature standard of 61 degrees daily maximum for several days during the summer sampling period. Although limited other water quality data is available for streams in the project area, no aceedences of state standards have been documented for parameters other than temperature. Iron Creek, Swauk Creek and Williams Creek have been designated as water quality limited for temperature on the current state 303(d) list. Stream temperature data for the planning area is summarized in Table III-1, below.

Table III-1. Swauk Watershed Water Temperature Monitoring Summary 1996 to 2007

Swauk Creek below First Creek	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Max Daily Temp.							71.2 F	88.0 F	74.5		71.5	
# Days > 61 F							60	73	77		66	
Max 7 Day Avg.							68.9 F	71.4 F	73.2		69.2	
# Days > 58 F							76	78	91		73	
# Days Sampled							135	112	126		125	
Williams Ck above confluence Swauk	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Max Daily Temp.							68.5		71.3		68.1	
# Days > 61 F							45		64		34	
Max 7 Day Avg.							66.6		69.2		65.6	
# Days > 58 F							65		76		66	
# Days Sampled							131		126		127	
Williams Ck above Old Town Mine	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Max Daily Temp.								68.3	70.7			
# Days > 61 F								59	62			
Max 7 Day Avg.								67.1	68.9			
# Days > 58 F								76	77			
# Days Sampled								133	126			
Williams Ck below 9726 culvert	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Max Daily Temp.								67.7	69.2			
# Days > 61 F								56	57			
Max 7 Day Avg.								66.6	67.2			

Table III-1. Swauk Watershed Water Temperature Monitoring Summary 1996 to 2007

# Days > 58 F								74	75			
# Days Sampled								133	126			
Williams Ck above 9728 culvert	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Max Daily Temp.								67.8	64.9			
# Days > 61 F								55	5			
Max 7 Day Avg.								66.5	62.5			
# Days > 58 F								74	5			
# Days Sampled								133	17			
Williams Ck (upper)	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Max Daily Temp.							57.5					
# Days > 61 F							0					
Max 7 Day Avg.							55.7					
# Days > 58 F							0					
# Days Sampled							135					
Lion Gulch below 9712-113	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Max Daily Temp.							75.0	62.1	71.3		75.9	
# Days > 61 F							32	6	49		20	
Max 7 Day Avg.							71.8	60.9	69.2		73.5	
# Days > 58 F							41	52	69		19	
# Days Sampled							135	146	126		98	
Lion Gulch above 9712-210	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Max Daily Temp.								56.8	58.8			
# Days > 61 F								0	0			
Max 7 Day Avg.								55.9	57.5			
# Days > 58 F								0	0			
# Days Sampled								139	125			
Cougar Gulch (Lower)	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Max Daily Temp.								72.3				
# Days > 61 F								18				
Max 7 Day Avg.								76.7				
# Days > 58 F								23				
# Days Sampled								78				
Cougar Gulch below 9718-112	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Max Daily Temp.							63.3	59.1	58.4		61.6	
# Days > 61 F							4	0	0		1	
Max 7 Day Avg.							59.4	58.2	57.4		58.6	
# Days > 58 F							23	2	0		0	
# Days Sampled							135	137	125		99	
Swauk Creek @ Mineral Springs	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Max Daily Temp.	70.8 F	69.9 F	73.2 F	69.9 F	72.6 F	70.7 F	69.5 F	70.3 F	72.1	68.6	69.2	68.6
# Days > 61 F	46	38	67	45	54	60	50	76	71	63	61	44
Max 7 Day Avg.	69.0 F	67.9 F	72.2 F	67.3 F	70.1 F	69.5 F	67.7 F	69.3 F	70.3	67.7	68.5	67.4
# Days > 58 F	57	50	77	53	68	72	67	81	81	77	71	61
# Days Sampled	80	89	106	85	111	93	132	132	126	123	127	103
Swauk Creek below Hurley Creek	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Max Daily Temp.							67.8 F	69.9 F	69.9			
# Days > 61 F							48	69	65			
Max 7 Day Avg.							66.2 F	68.9 F	68.2			
# Days > 58 F							61	78	77			
# Days Sampled							132	132	131			
Hurley Creek (Lower)	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Max Daily Temp.								63.3	66.8			
# Days > 61 F								8	18			
Max 7 Day Avg.								61.6	65.6			

Table III-1. Swauk Watershed Water Temperature Monitoring Summary 1996 to 2007

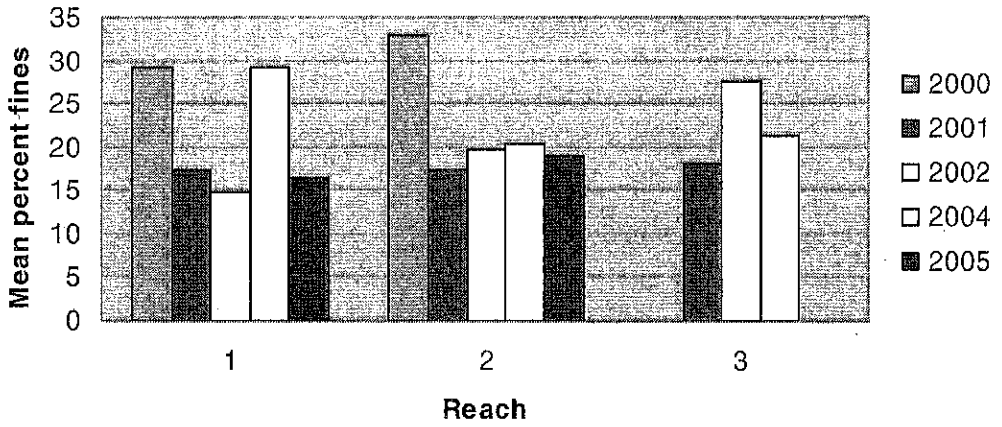
# Days > 58 F								28	24			
# Days Sampled								125	127			
Hurley Creek (Upper)	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Max Daily Temp.								58.4	54.0			
# Days > 61 F								0	0			
Max 7 Day Avg.								57.2	53.9			
# Days > 58 F								0	0			
# Days Sampled								131	127			
Swauk Creek @ Old Ski Lodge	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Max Daily Temp.								67.5 F				
# Days > 61 F								56				
Max 7 Day Avg.								66.6 F				
# Days > 58 F								66				
# Days Sampled								111				
Swauk Creek above Pipe Creek	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Max Daily Temp.							57.2 F	58.9 F	61.2		57.8	56.7
# Days > 61 F							0	0	1		0	0
Max 7 Day Avg.							55.7 F	57.9 F	59.9		56.4	55.4
# Days > 58 F							0	0	11		0	0
# Days Sampled							132	132	131		110	76
Blue Creek	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Max Daily Temp.						63.0 F	62.1 F	62.7	64.1		62.8	
# Days > 61 F						5	3	6	17		5	
Max 7 Day Avg.						61.8 F	60.5 F	61.4	63.23		61.4	
# Days > 58 F						13	18	39	53		9	
# Days Sampled						80	128	106	125		126	
Hovey Creek	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Max Daily Temp.							56.9 F	56.6 F	57.4		57.2	
# Days > 61 F							0	0	0		0	
Max 7 Day Avg.							55.9 F	56.2 F	56.8		56.8	
# Days > 58 F							0	0	0		0	
# Days Sampled							131	132	127		108	
Iron Creek	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Max Daily Temp.					65.8 F	65.2 F	63.8 F		65.2		63.1	61.7
# Days > 61 F					30	24	21		48		7	1
Max 7 Day Avg.					57.0 F	63.8 F	62.6 F		64.2		61.9	59.7
# Days > 58 F					49	48	43		73		44	13
# Days Sampled					112	80	131		127		127	76
West Fork Iron Creek	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Max Daily Temp.					53.2 F	64.1 F						
# Days > 61 F					0	24						
Max 7 Day Avg.					52.9 F	63.8 F						
# Days > 58 F					0	48						
# Days Sampled					109	80						

Water Quality -Fine Sediment

Fine sediment in spawning gravels has been monitored at three reaches of Swauk Creek beginning in 2000. Data is summarized below in Figure III-1. In general, fine sediment levels above 20 percent are considered detrimental to survival of salmonid eggs (see fisheries section for a discussion of effects on aquatic resources).

Figure III-1. Fine Sediment Monitoring Data

Mean percent fines in Reaches 1-3 of Swauk Creek, as measured in September of 2000, 2001, 2002, 2004 and 2005.



Water Quality – Fecal Bacteria

Very limited data on fecal bacteria and other nutrients has been collected from the Swauk area. No exceedances of state standards have been documented for these parameters although natural inputs from wildlife sources commonly raise bacteria levels in mountain streams. BMP's for protection of water quality such as control of grazing in riparian areas and designation of watering sites are believed to be successful in reducing the risk of increases in bacteria levels.

Past Disturbance

The Swauk planning area has a long history of forest management and public use activities. Access to the planning area is provided by an extensive road system including state highway 97 which bisects the allotment. Road densities for individual sub-watersheds within the Swauk watershed vary from a low of 2.2 miles per square mile in Iron Creek to a high of 6.3 miles per square mile for Cougar Gulch (U.S.D.A. Forest Service, Wenatchee National Forest1997a). Issues concerning soil compaction and disturbance to riparian areas associated with roads, trails, timber harvest, mining, grazing and recreation have been raised during past projects and analyses within the planning area. Restoration activities were begun in the mid-1990's to address known problem areas. Approximately 30 sites were included in the 1997 Swauk Dispersed Camping and Riparian Restoration Project (see map in analysis file).

Monitoring of the allotment over the past several years has identified problem areas which have resulted in alterations to the bedgrounds and routing locations or changes in grazing management. Places of concern and emphasis for future monitoring include: bedgrounds with proximity to riparian areas, routing near restoration areas, particularly Iron Creek 601 Road area, the crossing on Williams Creek between bedgrounds 1 and 2, the crossing on Pine Gulch, Cougar Gulch area and bedgrounds 12 and 13, utilization

near bedground 15 and 16, and in Lion Gulch, Hurley Creek and Dunning Meadows, disturbance in old landslide area, and closures on roads near bedgrounds to ensure closures are maintained.

Riparian Health Environmental Consequences

Effect of the No Grazing Alternative (Alternative 1) on Riparian Health
Under the No Grazing Alternative, recovery at restoration sites would continue without risk of damage from unintentional grazing by domestic sheep. Vegetative growth in riparian and key use areas would be slightly increased, resulting in reduced potential for soil erosion and reduced risk of sediment entering surface waters. Disturbances from sheep grazing would be eliminated from fragile or sensitive sites, including wet to moist meadow soils and vegetation within Riparian Reserves. Vegetative shading along streams at water access points would gradually increase in the long-term, although the area impacted is too small to likely result in any measurable improvement of water temperatures in the 303(d) listed waterbodies. Risk of fecal bacteria and other nutrient pollutants entering surface waters would be slightly reduced. Road closure and obliteration projects, and riparian restoration projects would exhibit slightly more effective vegetation and soil compaction recovery, resulting in more effective protection of water quality.

Effect of the Current Management Scenario (Alternative 2) on Riparian Health
The current management scenario would continue within the Swauk Allotment. Monitoring over the past several years has resulted in changes in bedground locations and trailing routes to address most of the areas where detrimental impacts to water resources were known or potentially occurring. Design criteria and BMP's have been developed to reduce the risk of grazing activities impairing water quality and long-term site productivity. Utilization standards for vegetation have the additional benefit of protecting soil and water resources by maintaining protective ground cover and reducing the risk of surface erosion.

Monitoring and enforcement of design criteria and BMP's would be part of project implementation. Best Management Practices (BMP's) for the protection of water quality from nonpoint source pollution (sediment, bacteria, nutrients, etc.) would be implemented as described in Chapter II. Implementation of these BMP's would reduce the risk of this alternative affecting soil productivity and water quality on-site, and local and downstream beneficial uses of waters outside the project area. Because BMP's would be implemented and effective, State water quality standards would be met and assure compliance with the Clean Water Act (U.S.D.A. Forest Service 1988). Vegetative shading along streams at water access points would be slightly reduced in the long-term, although the area potentially impacted is too small to likely result in any measurable change of water temperatures in the 303(d) listed waterbodies. Full implementation of BMP's has been shown to be an effective method in preventing and controlling nonpoint source water pollution (Rashin et al., 2006; U.S.D.A. Forest Service, Wenatchee National Resources

2000). Monitoring would be conducted during the project in order to validate implementation and effectiveness of BMP's.

Effect of Adaptive Management (Alternative 3) on Riparian Health
Under this alternative the effects would be similar to Alternative 2. A greater emphasis on allotment monitoring with this alternative would result in increased probability that problem areas would be identified before impacts to soil and water resources became measurable and adjustment to grazing practices would be made.

Monitoring and enforcement of design criteria and BMP's would be part of project implementation. Best Management Practices (BMP's) for the protection of water quality from nonpoint source pollution (sediment, bacteria, nutrients, etc.) would be implemented as described in Chapter II. Implementation of these BMP's would reduce the risk of this alternative affecting soil productivity and water quality on-site, and local and downstream beneficial uses of waters outside the project area. Because BMP's would be implemented and effective State water quality standards would be met and assure compliance with the Clean Water Act (U.S.D.A. Forest Service 1988). Vegetative shading along streams at water access points would be slightly reduced in the long-term, although the area potentially impacted is too small to likely result in any measurable change of water temperatures in the 303(d) listed waterbodies. Full implementation of BMP's has been shown to be an effective method in preventing and controlling nonpoint source water pollution (Rashin et al., 2006; .U.S.D.A. Forest Service, Wenatchee National Forest 2000). Monitoring would be conducted during the project in order to validate implementation and effectiveness of BMP's.

Cumulative Effects: This analysis considers the 5th field Swauk watershed as the cumulative impacts area under analysis. The majority of the proposed activity occurs within this area and the impacts outside of this area so minimal as to be negligible and not discernable from baseline conditions. Alternatives 2 and 3 would continue to contribute incrementally to cumulative watershed effects in the Swauk watershed. These effects include soil compaction of wet meadows and reduced localized water storage, riparian soil and streambank disturbance and erosion, and sedimentation of aquatic habitats. All of these effects are localized and relatively small in scale, but contribute cumulatively to other watershed disturbances. Sheep trailing and bedding, along with dispersed public camping, road and motorized trails including maintenance and use, in addition to concentrated wildlife use, all contribute to incremental and additive effects on these riparian and aquatic resources.

Adjacent state and private landowners, both within the Forest boundary as well as outside the boundary, allow grazing to be conducted on their lands with little administrative oversight. These effects will continue on non-federal lands and conditions on these lands are expected to contribute cumulatively to impacts on riparian and aquatic health. Logging is continuing on private lands within the allotment and watershed boundary. State forest practices are the mechanism for addressing cumulative riparian and aquatic effects from private lands. Mining activities occur along the Swauk Creek corridor and are regulated by state and federal water quality standards.

Fisheries Important Interactions and Affected Environment

While there is potential for sheep to trample fish redds or maybe even individual fish at crossings this can be minimized by not crossing streams with listed fish present, crossing on roads, or crossing after fish are expected to have emerged from gravel. The primary aquatic concerns associated with this project are potential impacts to fish habitat as opposed to direct harm or mortality to individual fish from trampling. Spence et al (1996) and Platts (1991) summarize the potential effects of livestock grazing on fish habitat. Based upon field reviews of the allotment and review of the mechanisms by which grazing may impact fish habitat summarized in Spence (1996) and (Platts 1991), the primary potential impact to fish habitat due to management of the Swauk Allotment is by grazing near and on stream banks which could reduce shrub cover; break down of banks increasing erosion and sediment delivery; contribute to channel widening and potential loss of pools and increase in stream temperature. Grazing through off-channel habitat could have similar impacts as describes for the main channel. Sheep often "release" conifers from competing vegetation; as they typically do not graze conifers, and as long as the trees are large enough to not be trampled. The potential for damage to conifers is greatest in very young stands such as in forest plantations or after a fire. A reduction in future large wood due to sheep grazing young stands is not expected as long as young stands adjacent to streams are protected (Jodi Leingang, personal communication).

Another potential effect of grazing is over-use of wet meadows, which could alter vegetation composition, compact soil, increase erosion and possibly decrease water storage capacity (Gifford 1981 and Platts 1981). Spence (1996) lists damage to cryotogamic crusts and resulting erosion as a potential effect of grazing.

Spence (1996) also lists increased nutrient deposition such as nitrogen and phosphorous could occur. Because the sheep are primarily grazing in upslope areas, are not bedding near water, we have no nutrient data, and visual inspection of the streams did not indicate increased periphyton or other aquatic vegetation growth leading one to suspect a potential for increases in nutrient supply, potential nutrient effects will not be discussed.

Under the Endangered Species Act, federal agencies are to consult with the NOAA (anadromous fish) and FWS (terrestrial species and freshwater fish) when management actions may affect a listed species or species habitat. The basis for the consultation between the Forest Service and their two regulatory agencies is "*A Framework to Assist in Making Endangered Species Act Determinations of Effect for Individual or Grouped Actions at the Bull Trout Subpopulation Watershed Scaled*" prepared by FWS, February 1998. The document was adapted from a similar document prepared by NOAA. On the Okanogan-Wenatchee National Forest the Forest Service, FWS and NOAA have agreed to use the FWS document as the basis for consultation. The Framework document includes the "Matrix of Diagnostics/Pathways and Indicators. The Matrix includes watershed condition and fish population and habitat elements, which are used to assess current conditions, potential effects to habitat and species, and consistency with the Aquatic Conservation Strategy. The Matrix elements are used to determine current

conditions and project effects to protected species and their habitat as well as determine consistency with the ACS. Based upon field review of the allotment primary matrix habitat and watershed condition elements, which may be affected by management of the Swauk Allotment, are Temperature, Sediment, Off-Channel habitat, Width/depth ratio, Streambank Condition, Riparian Conservation Areas (Riparian Reserves). The potential effects to these matrix elements could be a direct result of the grazing, allowing determination of indirect effects to other matrix elements such as pools, large wood substrate etc. The Matrix also provides the basis for determining potential effects to Essential Fish Habitat and habitat for sensitive species. Interim riparian reserve widths include important riparian processes potentially affected by grazing, including, root strength, large woody debris, leaf and particulate matter input, shade, riparian microclimate and water quality. The above mentioned matrix elements provide a means to assess impacts to the important riparian processes from the grazing program.

Fisheries Affected Environment/Existing Conditions

The proposed action is located in the Swauk watershed (1703000113). The Swauk watershed is 63,892 acres in size. The Swauk is not considered a Key Watershed as defined by the Northwest Forest Plan. A watershed analysis was completed on the watershed in 1997 (USDA). Watershed restoration has been on-going in the watershed. Fish-bearing streams in this watershed along the proposed grazing route include Swauk Creek, Williams Creek, Boulder Creek, Lion Gulch, Cougar Gulch, Billy Goat Gulch, Durst Creek, Hovey Creek, Pipe Creek, Park Creek, Iron Creek, West Fork Iron Creek, Hovey Creek, and Blue Creek. Small portions of the route follow the dividing ridges between the Swauk and Peshastin watersheds and the Swauk and Teanaway watershed. These portions of grazing allotment are located in the upper headwaters of the Peshastin and Teanaway where the streams are small 1st order, intermittent, nonfish-bearing tributaries. Grazing is confided to the ridgelines and any impacts to streams in the Pashastin and Teanaway watersheds are so minimal as to be negligible and can not be discerned from baseline conditions, therefore aquatic impacts from this project will not be evaluated further in the Teanaway or Peshastin watersheds.

Fish Species and Distribution

The Yakima River once produced an extremely abundant number of anadromous salmonids. Until the turn of the 19th Century, anadromous fish were said to abound in the Upper Yakima River (Gilbert and Evermann 1894). No actual fish numbers were recorded but it has been estimated that the Yakima River watershed could have supported at a minimum 500,000 spawning Chinook salmon (Davidson 1953). One reason suggested for the rapid decline in the fishery was the tremendous commercial fishery ongoing in the lower Columbia River (McDonald 1895). Gilbert and Evermann (1894) reported on the rapid development of cropland in the Yakima Basin and an extensive irrigation system. The development of irrigation systems was outgrowing the ability of the Yakima to supply water and it was thought that soon the entire flow would be withdrawn from the river. Finally, construction of dams in the upper Yakima, (i.e., Cle Elum, Kachess, Easton and Keechelus) in the early 1900's, contributed to the further decline of the anadromous fishery in the basin.

At least 16 species of fish are known to exist or to have existed in the past in the Swauk Watershed (Table III-2, below). These species include salmonid, resident salmonids and other fish. (Pearsons et al, 2002, Karp et al, 2003 and USDA Okanogan-Wenatchee NF 2004)

Table III-2. Fish Species Known to Exist or to Have Existed Historically in the Swauk Watershed.

Scientific Name	Common Name
Onchorhynchus kisutch	Coho salmon (extirpated)
Onchorhynchus tshawytscha	Spring Chinook salmon
Onchorhynchus clarki lewisi	Westslope cutthroat trout
Onchorhynchus mykiss	Steelhead, Rainbow trout
Salvelinus fontinalis	Brook trout (introduced)
Salvelinus confluentus	Bull trout
Ptychocheilus oregonensis	Northern pikeminnow
Rhinichthys cataratae	Longnose dace
Richardsonius balteatus	Redside shiner
Catostomus catostomus	Longnose sucker
Rhinichthys osculus	Speckled dace
Rhinichthys falcatus	Leopard dace
Catostomus columbianus	Bidgelip sucker
Cottus rhotheus	Torrent sculpin
Cottus sp.	Unknown species of sculpin
Cottus confusus	Shorthead sculpin

Aquatic Species of Concern

Bull trout are a federally listed Threatened species. A review of Ranger District documentation and other historical records, including Bureau of Fisheries survey reports from 1936 and 1937 do not record any observations of bull trout in the Swauk. The 1936 Bureau of Fisheries surveys identified "scarce" numbers of bull trout in the mainstem and North Fork Teanaway Rivers.

Surveys of fish presence by the WDFW Yakima Species Interaction Study Team (YSIS) were conducted from 1990 to 1997 (McMichael et al 1992); Martin et al 1994, Persons et al 1993, 1996 and 1998) in three index reaches on Swauk Creek. Site 1 is located 1.2 miles above the confluence with the Yakima. Site 2 is located above First Creek at Highway 97 at milepost 151.75. Site 3 is located 0.5 miles downstream of Medicine Creek at Highway 97 at milepost 158. No bull trout were located in any of these sampling efforts. Sampling was done by electroshocking using removal-depletion methods. One sub-adult bull trout was found in a Washington Department of Fish and Wildlife trap in Swauk Creek just above its confluence with the Yakima River in 1995.

The U.S. Fish and Wildlife Service has designated critical habitat for the Columbia River Basin Distinct population segments of bull trout. No portion of the Swauk watershed has been designated by USFWS as critical habitat for bull trout.

Steelhead are also a federally listed Threatened species found in the Swauk watershed. Historical records identify rainbow trout in large numbers in Swauk Creek and steelhead utilizing Iron Creek up until about 1915 (Bureau of Fish 1936).

In 2003, steelhead passing over Roza Dam were radio tagged and their migration monitored by Yakama Nation fisheries biologists. Nine steelhead entered Swauk Creek. One moved into First Creek, a tributary that enters Swauk Creek at river mile 8.1 just north of the U.S. Highway 97 and State Highway 970 junction and below the project area. One tagged fish was tracked up Swauk Creek to Swauk Campground at river mile 19.2. The remaining fish were located in Swauk Creek between river mile 8.1 and 19.2 (Karp, et. al. 2003).

In 2004, nine radio tagged steelhead once again entered Swauk Creek, one of which was a return from the previous year. Four of the fish spawned in Williams Creek (Karp et.al. 2005).

Critical habitat for steelhead has been designated in mainstem Swauk Creek up to Swauk Campground and into Iron Creek.

Redband trout (a subspecies of rainbow trout) and Westslope cutthroat trout are on the Regional Forester's Sensitive Species List. Cutthroat trout is also a Forest Management Indicator Species. Both species are found in Swauk watershed.

Additional Forest Management Indicator Species include sockeye and Chinook. Sockeye were extirpated from the Upper Yakima Watershed with the advent of dams and irrigation diversions in the watershed in the 1930's and are not found in the project area. Chinook are currently unable to access the upper Swauk subwatershed due to seasonal low flow and multiple water diversions found downstream of the Forest boundary.

Essential Fish Habitat (EFH) is defined in the Magnuson-Stevens Act as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" (16 U.S.C. 1802(10)). Waters include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; substrate includes sediment, hard bottom, structures underlying the waters, and associated biological communities; necessary means that habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and "spawning, breeding , feeding, or growth to maturity" covers a species' full life cycle.

The amended Magnuson-Stevens Act requires NOAA-Fisheries to minimize damage to Essential Fish Habitat from fishing practices, to the extent practicable. Additionally, the Act requires Federal agencies that authorize, fund, or conduct activities that "may adversely affect" EFH to work with NOAA-Fisheries to develop measures that minimize damage to EFH. The Swauk watershed contains suitable existing and historic essential freshwater habitat for Chinook and coho salmon (PFMC 1999). Essential Fish Habitat (EFH) for Chinook and coho are found within the project area.

Pygmy whitefish are identified on the Washington State Department of Fish and Wildlife Species of Concern List as a "State Sensitive Species." This species was historically found in at least 15 lakes in the state of Washington, they currently occupy nine of those lakes (Hallock and Mongillo 1998). Three of the lakes, Keechelus, Kachess and Cle Elum are located in the Upper Yakima watershed. None of these three lakes are located within the Swauk Teanaway 5th field watersheds. No historical data or current survey information indicate that pygmy whitefish occupy the Swauk watershed. Due to their lack of presence, pygmy whitefish will not be address further in this analysis.

Aquatic Habitat

There is a total of 442 miles of streams in the Swauk watershed. Of these, miles 57 miles are fish-bearing.

Water Temperature: Salmonids (salmon, trout and char, including bull trout) require cool clean well-oxygenated water to survive. The maximum temperature that salmonids can tolerate varies by species, life stage, prior acclimation, oxygen availability, duration of warmer temperatures, and the presence of pollutants (Wash Dept of Ecology 2000). Juvenile and adult salmon will generally occupy water around 13°-18°C (55°-65°F), with warmer water selected only if excess food is available (Wash Dept of Ecology 2000). When temperatures are above optimum levels, fish are physically stressed and more likely to get fungal infections, have difficulty getting oxygen, and, if the temperatures get above the lethal limits of 25°C (77°F) most salmonids will die (Oregon Dept of Environ. Quality 2000).

See the Hydrology section of this document for discussion of water temperature.

Fine Sediment: Erosion and sedimentation within streams are natural processes and are influenced by streamflow, channel structure and stability, streambed composition and by disturbances within watersheds such as fire and landslides. Fine sediment from a fishery standpoint is generally defined as fine inorganic waterborne material below a certain specified diameter (Everest et.al. 1987). The diameter of sediment in which the Wenatchee Forest Plan Standards and Guidelines are base is 0.85mm and smaller (WNF 1992).

Increases in sediment concentrations above natural levels can have a detrimental impact on fish and fish habitat. A fish's susceptibility to sediment depends on the species and life stage (Lloyd 1987). Suspended sediment can cause gill damage that may lead to death (Thompson 2004). Excessive sediment in the streambed may act as a physical barrier that may smother incubating fish eggs or stop the emergence from the gravel of fry (Thompson 2004). Excessive sediment can have indirect effects on fish by decreasing visibility affecting feeding, reducing populations of prey organisms, filling in pools decreasing living space and decreases dissolved oxygen concentrations in the water.

See the Hydrology section of this document for discussion of fine sediment.

Off-Channel Habitat: All reaches of Swauk Creek with the exception of Reach 1, which has 10% of its available habitat found in side channels, are not functioning properly. Reach 2 had 0.3% of its available habitat found in side channels while Reaches 3 through 7 had 0% of the habitat in side channels (USDA 1991 Swauk Creek Report). First Creek had been channelized below the National Forest boundary. Iron Creek had probably lost off channel habitat due to road encroachment. Generally highway construction, wood removal, loss of beaver, mine dredging has resulted in the loss of off-channel habitat in the Swauk watershed.

Width/Depth Ratio: Channel sinuosity within the depositional reaches of many Swauk streams was naturally higher than at present with wide meander bends, side channels, and abandoned oxbow lakes. Grazing, clearing of riparian vegetation, historical dreadging during mining, and diking for road construction had resulted in accelerated downcutting and gullying (USDA 1997c). Channel confinement due to the construction of State Highway 97 had resulted in the loss of 1.5 miles of Swauk Creek. The channel has further been confined by dredging during historical mining operations in Swauk Creek from above First Creek to Baker Creek and in lower Williams Creek, and Deer Gulch (USDA 1997c). Channel aggradation is evident in First Creek, Iron Creek and West Iron Creek. Four-wheel drive trails and cross-country travel by ORV's have contributed to accelerated erosion and stream channel entrenchment in Pine Gulch, Deer Gulch, First Creek, Baker Creek, Medicine and Hovey Creek (USDA 1997c). Width/depth in the headwaters and upper portions of Swauk Creek are functioning appropriately. Overall the watershed is considered not functioning properly because width/depth has been altered in many tributaries as well as the mainstem Swauk Creek.

Streambank Stability: Natural surface erosion and mass wasting of streambanks occur over prolonged periods but usually in equilibrium with bank rebuilding processes. During floods, water moving at high velocity transports large amounts of sediment within streams. As flood waters rise up over streambanks, streamside vegetation reduces water velocities along the edge causing sediment to settle out and become part of the bank. Deposition of these sediments contribute nutrients to streambank soils and increases plant production and vigor. Where streamside vegetation is insufficient and there is increased bank erosion.

Forest roads, Highway 97 and dredging during past mining activities have narrowed channels, reduced sinuosity which is resulting in accelerated entrenchment of streams in the valley floor and accelerated bank erosion along Swauk Creek and some tributaries (USDA 1997c). Grazing and harvest of riparian trees and the loss of beaver has further contributed to unstable streambanks. The Swauk watershed is considered not functioning properly.

Riparian Reserves: Riparian Reserves and wetlands areas are the vegetative zones bordering lakes, ponds, springs and seeps, wet meadows, ephemeral, intermittent and perennial streams. Riparian areas provide the link between terrestrial habitats and aquatic habitats. These areas are important to maintaining aquatic habitat. Riparian areas also can provide refugia and dispersal habitat for many terrestrial species.

Riparian Reserves were established as a key element of the Aquatic Conservation Strategy (ACS) in the Northwest Forest Plan (NFP). Riparian Reserves were established as a land allocation to maintain and restore riparian structure and function of intermittent streams, confer benefits to riparian-dependent and associated species other than fish, enhance habitat conservation for organisms that are dependent on the transition zone between upslope and riparian areas, improve travel and dispersal corridors for many terrestrial animals and plants and provide for greater conductivity of the watershed. Riparian Reserves also serve as connectivity corridors between Late-Successional Reserves.

Riparian Reserves as defined by the NFP include those portions of a watershed required for maintaining hydrologic, geomorphic, and ecological processes that directly affect standing and flowing water bodies such as lakes and ponds, wetlands, streams, stream processes, and fish habitats. Riparian Reserves are primary source areas for wood and sediment such as unstable and potentially unstable areas in headwater areas and along intermittent stream channels, ephemeral ponds, and wetlands. Riparian Reserves generally parallel stream networks but also include other areas necessary for maintaining hydrologic, geomorphic and ecological processes.

The project area includes riparian areas along Williams Creek, Lion Gulch, Boulder Creek, Cougar Gulch, Harkness Gulch, Swauk Creek, Hurley Creek, Hovey Creek, Iron Creek and several tributary perennial streams, intermittent streams, ephemeral wetlands and swales. For analysis purposes, an average width of 300 feet was assigned to perennial fish-bearing streams and 150 feet for intermittent non-fish-bearing streams. The Riparian Reserves encompass 5,855 acres or 11% of the watershed.

With respect to Riparian Reserves, the watershed has had a long ongoing history of land management activities beginning in the late 1800's with the immigration of white settlers into the area. Early activities began with gold mining, livestock grazing and homesteading. Other land management activities have evolved over time to include timber harvest, road and highway construction and outdoor recreation. Riparian areas as a result of these activities have been impacted

Associated with much of the road building within the watershed, has been timber harvest. Prior to the mid-1990's clearcutting of timber was occurring within Riparian Reserves of the fish-bearing streams within the Swauk watershed which encompasses the project area. Based on GIS analysis of the watershed, vegetation and timber stands, 1,339 acres of Riparian Reserves have been harvested in the past.

Outdoor recreation is a popular ongoing activity occurring within the watershed. There are a wide array of activities taking place including camping and picnicking in developed campgrounds and dispersed sites, off-highway vehicle riding, hiking, bicycling, horseback riding, hunting, fishing and gold and mineral exploration. A large proportion of these pursuits occur adjacent to streams within riparian reserves because this is where

roads and trails are located and because of natural human attraction to water. The Swauk watershed is considered not functioning properly.

Fisheries Environmental Consequences
The effects of the alternatives of fish and their habitat will be analyzed by considering the following indicators: water temperature, sediment, off-channel habitat, width/depth ratio, Riparian Reserves and streambank stability

Effect of the No Grazing Alternative (Alternative 1) on Fisheries
Water Temperature: For the past eight years range administration has worked to relocate bedding ground, campsites and re-routes of the livestock to avoid sensitive riparian areas along the grazing route. This has lead to the recovery of riparian vegetation in several areas of concern along Iron Creek, West Fork Iron Creek and Hovey Creek which would result in a small incremental improvement in water temperatures in these watersheds. There are some isolated portions of the route that continue to show moderate to heavy vegetation disturbance along streambanks. These include Williams Creek at the 9726 Road crossing and Swauk Creek upstream from the 9715 Road. With the removal of grazing under this alternative vegetation would be expected to more fully recover in the areas where there is still some isolated vegetation disturbance leading to small incremental improvement in water temperatures in the Swauk watershed and an improvement to fish habitat.

Fine Sediment: With the removal of livestock grazing, the remaining areas with chronic streambank disturbance would recover, resulting in a decrease in the delivery of fine sediment into streams along the grazing route. This would result in an incremental reduction in fine sediment levels and an improvement to fish habitat.

Off-Channel Habitat: Past grazing practices in the Swauk have had similar effects to off-channel habitat as mainstem channels. Off-channel habitat is very limited in Swauk, mainly found in drainages with broad, low gradient floodplains such as that along mainstem Swauk Creek. With the removal of livestock grazing in isolated areas there would be an small incremental improvement to off-channel habitat with the recovery of vegetation and streambank stability, which would result in an incremental improvement of fish habitat.

Width Depth Ratio: With the removal of livestock grazing, the remaining areas with chronic streambank disturbance would recover, resulting in a decrease in the delivery of fine sediment into streams along the grazing route. This would result in an incremental reduction in fine sediment levels, along with an associated reduction of width/dept ratios and an improvement to fish habitat.

Streambank Condition: With the removal of livestock grazing, the remaining areas with chronic streambank disturbance would recover, resulting in a small incremental improvement of vegetation cover along the streams. This recovery will provide increase streambank stability along creeks reducing streambank erosion (see previous discussions

on water temperature and fine sediment). These will lead to a small incremental improvement to fish habitat.

Riparian Reserves: The removal of livestock will result in a small incremental improvement in riparian vegetation. This will result in an incremental recovery of the riparian vegetation which will result in improved fish habitat through low water temperatures, reduced bank erosion and fine sediment delivery.

Effect of the Current Management Scenario (Alternative 2) and Adaptive Management (Alternative 3) on Fisheries

Water Temperature: Over the last several years the District has worked with the Okanogan-Wenatchee South Zone Range Administrator to relocate bedding grounds, campsites, re-route the livestock, and in some locations, have the permittee set up temporary fencing. These changes were intended to avoid and protect sensitive areas, eliminate soil and vegetation disturbances, or change the frequency of disturbance to reduce resource impacts. With the implementation of these changes, there has been healthy recovery of riparian vegetation along Iron Creek, West Iron Creek, and Hovey Creek that is now providing shading to these water bodies. With continued monitoring and implementation of conservation measures over time within the allotment, it is expected there will incremental declines in water temperatures in the streams as previously overgrazed and trampled vegetation recovers. Also as the vegetation recovers not only will there be an increase in shade potential but the vegetation will provide increased bank stability, reducing streambank erosion and the potential of the streams to become shallower and wider and increasing water temperatures. The implementation of this alternative is expected to maintain existing baseline conditions and over time result in a small incremental restoration of baseline conditions.

Fine Sediment: Elevated fine sediment levels have been attributed to multiple disturbances, including roads, uncontrolled recreation, grazing and past timber harvest. The recent and chronic disturbance has been associated with grazing. Over the last several years the District has worked with the Okanogan-Wenatchee South Zone Range Administrator to relocate bedding grounds, campsites, re-route the livestock, and in some locations, have the permittee set up temporary fencing. These changes were intended to avoid and protect sensitive areas, eliminate soil and vegetation disturbances, or change the frequency of disturbance to reduce resource impacts. With the implementation of these changes, there has been healthy recovery of riparian vegetation along Iron Creek, West Iron Creek, and Hovey Creek. With continued monitoring and implementation of conservation measures over time within the allotment, it is expected there will incremental declines in sediment levels in the streams as previously overgrazed and trampled vegetation recovers. Also as the vegetation recovers it will provide increased bank stability, reducing streambank erosion and the potential of the streams to become shallower and wider with increasing water temperatures. The implementation of thi alternative is expected to maintain existing baseline conditions and over time result in a small incremental restoration of baseline conditions.

Off-Channel Habitat: Effect to off-channel habitat from past livestock grazing practices in the Swauk Allotment is similar to those that happened on the main stream channels. Implementation of conservation measures along with continued close monitoring over time is expected to result in recovery of vegetation and streambank stabilization similar to what is currently occurring on other main stream channels in the allotment. The implementation of this alternative is expected to maintain existing baseline conditions and over time result in a small incremental restoration of those baseline conditions.

Width Depth Ratio: Elevated fine sediment levels also result in increase in stream widths. With the implementation of these changes, there has been healthy recovery of riparian vegetation along Iron Creek, West Iron Creek, and Hovey Creek. With continued monitoring and implementation of conservation measures over time within the allotment, it is expected there will incremental declines in sediment levels in the streams as previously overgrazed and trampled vegetation recovers. Also as the vegetation recovers it will provide increased bank stability, reducing streambank erosion and the potential of the streams to become shallower and wider with increasing water temperatures. The implementation of this alternative is expected to maintain existing baseline conditions and over time result in a small incremental restoration of baseline conditions and an improvement to fish populations.

Streambank Condition: Over the last several years the District has worked with the Okanogan-Wenatchee South Zone Range Administrator to relocate bedding grounds, campsites, re-route the livestock, and in some locations, have the permittee set up temporary fencing. These changes were intended to avoid and protect sensitive areas, eliminate soil and vegetation disturbances, or change the frequency of disturbance to reduce resource impacts. With the implementation of these changes, there has been healthy recovery of riparian vegetation along Iron Creek, West Iron Creek, and Hovey Creek. With continued monitoring and implementation of conservation measures over time within the allotment, it is expected there will incremental increase in streambank stability as previously overgrazed and trampled vegetation recovers. The implementation of this alternative is expected to maintain existing baseline conditions and over time result in a small incremental restoration of baseline conditions and an improvement to fish populations.

Riparian Reserves: Over the last several years the District has worked with the Okanogan-Wenatchee South Zone Range Administrator to relocate bedding grounds, campsites, re-route the livestock, and in some locations, have the permittee set up temporary fencing. These changes were intended to avoid sensitive areas, eliminate soil and vegetation disturbances, or change the frequency of disturbance to reduce resource impacts. With the implementation of these changes, there has been healthy recovery of riparian vegetation along Iron Creek, West Iron Creek, and Hovey. With continued monitoring and implementation of conservation measures over time within the allotment, it is expected there will incremental increases in vegetation as previously overgrazed and trampled vegetation recovers. The implementation of this alternative is expected to maintain existing baseline conditions and over time result in a small incremental restoration of baseline conditions and an improvement to fish populations. Through

implementation of design criteria and best management practices identified in Chapter II, Alternatives 2 and 3 would be consistent with all applicable Riparian Reserve standards and guidelines.

Cumulative Effects:
This analysis considers the 5th-field Swauk watershed as the cumulative impacts area under analysis. Alternatives 2 and 3 would continue to contribute incrementally to cumulative watershed effects at localized, not widespread areas. These effects include soil compaction of wet meadows and reduced localized water storage, riparian soil and streambank disturbance and erosion, and sedimentation of aquatic habitats. All of these effects are localized and relatively small in scale, but contribute cumulatively to other watershed disturbances. Domestic livestock, along with dispersed public camping and horseback riding, roads and motorized trails maintenance and use, in addition to concentrated wildlife use, all contribute to incremental and additive effects on these riparian and aquatic resources.

Adjacent state and private landowners, both within the Forest boundary as well as outside the boundary, allow grazing to be conducted on their lands with little administrative oversight. These effects will continue on non-federal lands and conditions on these lands are expected to contribute cumulatively to impacts on riparian and aquatic health. Logging is continuing on private lands within the allotment and watershed boundary. State forest practices are the mechanism for addressing cumulative riparian and aquatic effects from private lands.

Consistency with Aquatic Conservation Strategy Objectives
The proposed AMP is consistent with the Aquatic Conservation Strategy objectives (ACSO). The project will maintain all nine objectives of the ACS at site and 5th field watershed scale.

The new AMP has adjusted routing and bed grounds to avoid identified areas where the old grazing strategy was degrading riparian habitat retarding restoration (Northwest Forest Plan standards GM-1, 2, 3 and Wenatchee National Forest Riparian Standards

Areas where past grazing was degrading streambanks, impacting shade, causing unstable banks accelerating erosion, possibly causing an increase in width/depth ratio and causing a loss or reduction in riparian vegetation or retarding riparian/aquatic habitat restoration are avoided (ACSO 1, 2, 3, 4, 5, 8. 9).

Criteria for bed grounds are expected to avoid soil compaction within Riparian Reserves that may impact fish habitat by denuding the vegetation necessary for shade, bank stability, litter input and cause accelerated sediment delivery (ACSO 3, 5, 7, 8, 9).

Areas of wet meadows both upslope and stream adjacent are avoided to allow recovery (ACSO 6, 7, 8).

Analysis of Alternative 2 and 3 considered the requirements under the Magnuson-Stevens Act that protects Essential Fish Habitat for anadromous fish species. Implementation of the project design criteria and best management practices in concert with compliance with standards and guidelines minimizes the potential for adverse impacts to riparian reserves to the degree that there would be no effect on essential fish habitat.

Adaptive management and requirements for monitoring at specific locations are integral parts of the decision and thus required for implementation, thus adding further assurance that design criteria and mitigations are implemented; and if not successful are modified.

Terrestrial Ecosystem Health

Important Interactions

Livestock, and other ungulates, can significantly influence terrestrial ecosystem health by affecting ecosystem process and function at several scales over space and time (Hobbs 1996). Herbivory (grazing or browsing on vegetation by ungulates) can have a dramatic influence on plant species composition and structure (Pieper 1994, Miller et al 1994, Milchunas et al 1988, Pieper and Heitchmidt 1988, Caldwell 1984). Grazing selectively removes preferred grasses, forbs, and shrubs and consequently has an important influence on the abundance and distribution of species in these communities. The degree of influence herbivory has on plant community composition depends on the interaction of grazing with other biotic and abiotic factors. Factors such as the evolutionary history of grazing in the ecosystem, grazing intensity, season, duration and frequency, level of selectivity and site characteristics significantly influence the site-specific effects of herbivory on composition (Miller et al 1994, Milchunas et al 1988). The resiliency (the ability of an ecosystem to recover following acute or chronic disturbance) of a specific plant community, as well as a species' ability to regrow following defoliation, must also be considered (Miller at al 1994, Pieper 1994, Briske 1991).

Continued long-term heavy grazing can adversely affect the most palatable species by removing a greater proportion of photosynthetic tissue from these species. The competitive advantage is then gained by the less palatable species, increasing their influence in the community (Pieper 1994, Briske 1991, Archer and Smeins 1991, Mueggler 1972, Mueggler 1970). The reduction of preferred species in response to long-term grazing is well documented in the literature (Miller et al. 1994, Shiflet 1994, Hull 1976, Franklin, and Dyrness 1973). Studies indicate that the removal of perennial native understory vegetation may potentially create conditions that are more favorable for the establishment of coniferous vegetation and result in an increase in tree density (Pastor et al.1988, Ross et al. 1970, Rummell 1951). Rummell (1951) observed that grazing resulted in an increase in tree densities on Devil's Table. Others have documented that the removal of the perennial understory vegetation facilitates the dominance of introduced shallow rooted annual and tap-rooted species adapted to reduced water tables (Miller et al 1994, National Research Council 1994). Many of these species are considered to be noxious weeds or undesirable vegetation and in general, are not as

effective at performing certain ecosystem functions (e.g., soil stabilization and water conservation) as is the native vegetation.

Intensive grazing, often due to the concentration of grazing activities by topography, and the distribution of palatable forage plants or localized water sources, can result in the development of a patch within a matrix of a different vegetation community (Miller et al. 1994, Hill 1991, Hamilton et al 1973, Atsatt and O'Dowd 1976, Anderson 1971). At the landscape scale, herbivory may potentially result in an increase in landscape heterogeneity (Wiens 1985).

The effects of moderate and light grazing are less clear. Currently available information suggests plant communities subjected to light to moderate grazing over the longer-term may remain unchanged from adjacent ungrazed sites (Beedlow et al 1988, Laycock 1967, Mueggler 1950), and that under certain conditions, plant communities may be restored to a good ecological condition under moderate or light grazing (Pieper 1994, Kindschy 1987, Sneva et al 1984). Studies further indicate that moderate grazing may contribute to a greater level of species diversity than either light or heavy grazing (Pickett and White 1986, Peet et al 1983, Grime 1979, Grime 1973). Pieper (1994) and Stoddard and Smith (1943) do however report that some plants are detrimentally impacted by even low levels of grazing.

Current research indicates that herbivory may either reduce or increase ecosystem productivity depending on site-specific factors (Pastor et al 1988, Gessman and MacMahon 1984, Crawley 1983). Defoliation potentially affects plant resource allocation, growth rate, reproductive capacity and vigor (Maschinski and Whitham 1989, Bilbrough and Richards 1993). Frequent repeated grazing and browsing results in the continued removal of photosynthesizing vegetation (leaf area) and a subsequent reduction in the potential for the plant to capture and store energy (total carbon gain) (Hodgkinson et al 1989, Belsky 1986, Wallace et al 1985). Eliminating the ability of a plant to acquire energy has a direct effect on long-term plant productivity and the ability of the plant to reproduce. Over the long-term, plant health and vigor is reduced and the preferred species eliminated from the community.

A great deal of evidence suggests that plant productivity can be stimulated by defoliation or grazing (Williamson et al 1989, Paige and Witham 1987, Hilbert et al 1981, Dyer et al 1982, McNaughton 1985, McNaughton 1984, McNaughton 1983, McNaughton 1979, Heady 1975). There are several studies that suggest that moderate to light grazing and browsing has a positive affect on plant productivity because plants respond to the disturbance by overcompensating, ultimately achieving greater fitness (Inouye 1982, Hilbert et al. 1981, Owen 1980, Hendrix 1979, Stenseth 1978, Simberloff et al. 1978, Porter 1976, Owen and Wigert 1976, McNaughton 1976, McNaughton 1979, Dyer 1975, Chew 1974, Vickery 1972). The "grazing optimization hypothesis" states that defoliation results in an increase in primary plant production above that of ungrazed plants with an increase in grazing intensity to a threshold at which point primary production decreases with increased grazing intensity (McNaughton 1979, McNaughton 1976, Dyer 1975). The degree of increase in production is related to a species capability for regrowth

following a disturbance and the opportunity for regrowth, in terms of moisture availability, extent and timing of precipitation, and availability of soil nutrients (Hobbs 1996).

Increased grazing intensity commonly results in the creation of a "grazing patch or lawn" where plants are maintained in a juvenile, rapidly growing state as a result of continual feeding by herbivores. The maintenance of these patches in an early successional state results in food supplies that accelerate energy gain by ungulates relative to the ungrazed condition and therefore increases the likelihood that animals will feed in that patch again. (Dutoit 1990, McNaughton 1984). However over the long-term, the repeated use of these patches ultimately results in an area dominated by species of low palatability and grazing-induced enhancements in forage quality may be more than offset by grazing-induced reductions in the quantity or forage available (Hobbs et al. 1996, Pieper and Heitschmidt 1988). The net effect of herbivory on plant production is the relative occurrence of growth stimulating and growth inhibiting responses which are significantly influenced by the associated environmental conditions. Therefore, a range of responses to defoliation by herbivores, from positive to negative, may be observed even in plants of the same species under different environmental conditions (Noy-Meir 1993, Huntley 1991).

The removal of the standing crop biomass by herbivores reduces the fire ignition potential, and ultimately the fire return interval, associated with a grazed area (Miller 1994). Herbivores can reduce the frequency, extent and intensity of wildland and prescribed fire on the landscape (Pieper 1994, Stronach and McNaughton 1989, Frost and Robertson 1987). The degree of influence is dependent on environmental factors controlling net primary production. Areas of low and high productivity are influenced to a lesser degree than moderately productive areas because in low productivity areas, fuels are rarely adequate to support either frequent or large fires and in highly productive areas, productivity is so great that fires occur regardless of grazing (Frost and Robertson 1987). Because the susceptibility of any given patch on the landscape depends on the susceptibility of the surrounding patches (Knight 1987), the mosaic created by grazing can create effective fuel breaks between highly susceptible patches (McNaughton 1992, Turner and Bratton 1987).

Defoliation of the vegetation through grazing and browsing directly influences the amount of plant biomass contributed to the developing duff layer and therefore; the rate of litter accumulation, turnover and nutrient availability (Irwin et al. 1994, Miller 1994, McNaughton et al. 1988, Gessaman and MacMahon 1984, Tiedemann and Berndt 1972). Pastor et al. (1988) reported significant decreases in litter depth, as well as decreases in soil carbon, total nitrogen (N), cation exchange capacity, field nitrogen availability, potentially mineralizable nitrogen, and microbial respiration rates when comparing grazed areas to areas that had not been grazed for over 40 years. In general, grazing accelerates the process for turnover and consequently increases nutrient cycling rates (Hobbs 1996, Lauenroth et al.1994, Barrow 1967). Nutrients consumed, digested, and deposited in feces and urine return to the soil more rapidly and in a form more readily available for uptake than through senescence-decomposition pathways, consequently,

increasing the potential for greater losses (Hobbs 1996, Lauenroth et al. 1994). The amount of nutrients exported off site, lost via volatilization and redistributed on the site by livestock depends on the intensity of grazing and the season that the grazing occurs (Miller et al. 1994). A significant portion of the nitrogen excreted by domestic herbivores may be lost through volatilization (Parton et al. 1988, Schimel et al. 1986, Woodmansee 1978, Williams 1970, Simpson 1968). In contrast, Tiedemann et al (1986) documented considerably less loss via volatilization in moderately grazed grasslands in the Pacific Northwest. Pieper (1977) documented estimates of other nutrient removal from grazed rangelands as small for most elements, however long-term heavy grazing can gradually deplete soil nutrients (Miller et al. 1994).

Herbivores also influence the distribution of nutrients in an ecosystem by consuming nutrient containing vegetation over large areas and then concentrating the redistribution of the subsequent urine and fecal deposition spatially as a result of selective use of landscape positions (Ruess and McNaughton 1987, Pieper 1977, Heady 1975). Nutrients become concentrated in areas where livestock concentrate such as near water and in areas of level terrain. Urine and fecal deposition may potentially enhance local conditions for grazing by increasing nutrient concentrations and subsequently, plant biomass production in areas preferred by herbivores (Day and Detling 1990, Weins 1985, McNaughton 1984, McNaughton 1976). Conversely, water quality of rangeland streams may be degraded by redistributing nutrients into already nutrient-rich riparian areas (Pieper 1994).

Nutrient cycling is closely related to soil-water relationships. The processes that occur in soils provide plants with nutrients and water (Natural Research Council 1994). Microorganisms in the soil function to breakdown plant litter, releasing nitrogen, phosphorus, and other nutrients essential for plant growth. The texture, structure and porosity of the soil influence the amount of rain captured during a storm event and subsequently, the amount of water and nutrients available for plant growth (National Research Council 1994). Soil texture, structure, moisture content, standing vegetation or litter and duff cover (partly decayed organic matter), and organic matter content are properties of soil that significantly influence water infiltration and percolation (Satterlund 1972, National Research Council 1994.). Branson et al. (1981) suggests that the hydrologic conditions of rangeland sites reflect a complex interaction between many variables including: soil depth, texture, structure, bulk density, and compaction; ground cover of living and dead vegetation; and grazing intensity. Heavy grazing and associated trampling can result in the removal of a significant portion of the standing vegetation and subsequently, the litter and organic matter eventually incorporated into the soil. The loss of organic matter can lead to the formation of soil crusts that encourage water to run off as overland flow rather than be absorbed into the soil profile. Reduced water infiltration and storage can reduce total vegetative biomass production and ultimately result in shifts in species composition (Archer 1989). These altered environments are particularly vulnerable to colonization by noxious weeds and exotic species. Further, many researchers (Mack and Thompson 1982, Johansen 1986, Harper and Marble 1988, Rickard and Vaughan 1988) have observed apparent reductions in microphytic crusts (a complex surface mat of mosses, lichens, liverworts, algae, fungi and bacteria) following livestock trampling. The microphytic component may play a large role in water

infiltration, nutrient cycling, erosion and succession dynamics (Miller 1994, Harper and Marble 1988, Johansen 1986, West 1990, Klubeck and Skujins 1980, Blackburn 1975, Schlatterer and Tisdale 1969, Crawley 1983, Eckert et al. 1986, St Clair et al. 1984). Marble and Harper (1989) observed that mosses and foliose lichens appeared to be more susceptible to livestock trampling than crustose lichens and microscopic forms. Moderate mechanical disturbance may stimulate the crustose lichens and microscopic forms which are more important in nitrogen fixation (West 1990).

Although there is apparent controversy regarding the effects of grazing intensity on infiltration rates, Johnson (1992) identifies numerous studies, covering the last century, that underscore the adverse hydrologic effect of grazing on soils (increased runoff and erosion). Johnson (1992) identifies conclusions by Gifford and Hawkins (1978), which found that grazing affected infiltration at any intensity. Wilcox and Wood (1988) found that the hydrologic effects of light sheep grazing (10 ha/AU) on steep slopes (30-70%) reduced infiltration rates 12-17% lower than on ungrazed slopes. In contrast, Patric and Helvey (1986) summarizes numerous studies that demonstrate that under moderate and light grazing conditions, observed increases in bulk density, reduced pore volume and infiltration rarely became significant to overall hydrologic functioning of watersheds. Impacts are however observed on infiltration under moderate grazing conditions on highly erodable sites and those with inherently low rates of water movement. Under these conditions, moderate grazing was considered acceptable only when sufficient litter and duff were present to protect the soil surface (Linnartz et al.1966).

Trampling by herbivores can also result in soil compaction and displacement (National Research Council 1994, Cook and Stubbendieck 1986, Alderfer and Robinson 1947, Meeuwig 1965). The physical deterioration of the soil structure through compaction reduces the ability of the water to infiltrate the soil surface and percolate through the soil profile. Severe compaction can result in the formation of soil crusts and erosion pavements. These highly compacted areas often exhibit accelerated erosion which contributes to a reduction in total organic matter and nitrogen contents of soils (Natural Research Council 1994). The loss of organic matter in the soil reduces available nutrient stores and interrupts nutrient cycles. A reduction in organic matter further reduces the water-holding capacity of the soil (Croft et al. 1943). These conditions can impede seed germination and seedling establishment and growth (Blaisdell and Holmgren 1984, Troeh et al. 1991, Warren et al. 1986). Conversely, under some conditions, trampling has been observed to increase soil surface roughness with the potential benefits of slowing overland flow and increasing infiltration (Sanchez and Wood 1987, Abrahams et al. 1988, Johnson and Blackburn 1989). Humphrey (1962) suggests that rangeland soil compaction by trampling, and the subsequent reduction in site- productivity, results primarily from overgrazing and/or heavy grazing on wet soils. He further indicates that rangelands grazed by sheep, which have small hooves and which usually graze in flocks, are particularly liable to compaction damage.

While grazing and trailing of domestic livestock has been identified in the literature as contributing to soil compaction, current thinking is that grazing and trailing of the sheep contributes only negligible increases to soil compaction, and those effects are short-lived.

This view is based on the assumptions that; 1) the band of sheep is dispersed, moving steadily along a route, 2) forage is well-distributed preventing concentrated grazing from occurring, and 3) the ground pressure applied by sheep hooves, and the subsequent compaction, is limited to the near surface soil horizon where bulk densities can recover through root penetration, freeze thaw cycles and microbial activity. Circumstances that require the herder to concentrate the sheep into a restricted area, such as; trailing along roads and over cutslopes, or nightly bedding are most likely to result in plant cover loss and cutslope erosion.

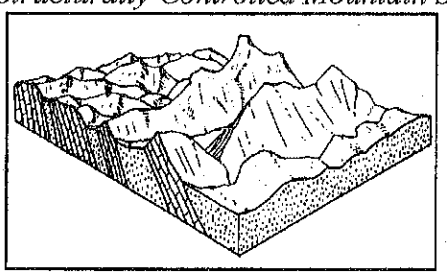
Soil and Site-Productivity Affected Environment

In order to determine the existing condition of soils within the proposed activity area, field investigations were conducted to determine if and how the existing soil condition was affected by past grazing management activities. Traverses were used to determine the extent of past grazing activities and their effect on the existing soil condition. Soils in the activity area considered sensitive to disturbance and management activities that have a greater chance of causing detrimental disturbance had a greater intensity of reconnaissance including: transects through sites with visual observations of plants, ground cover, organic material and detrimental disturbance. Sensitive soils are those with volcanic ash or sandy loam surfaces, little to no surface or profile rock fragments, fine textured soils and high soil moisture in the surface or upper horizons Activity areas without sensitive soils received lower intensity reconnaissance. Investigations included: traverses with random sampling. Ocular estimates were supplemented by periodic checking of the accuracy of ocular estimates with more rigorous forms of sampling supporting these observations (Tepler field notes, 2007).

Geology/Geomorphology

The following landforms occur in the analysis area. For more information on the landforms discussed below, see *Landtype Associations of Central Washington* (U.S.D.A. 2004).

Structurally Controlled Mountain Slopes

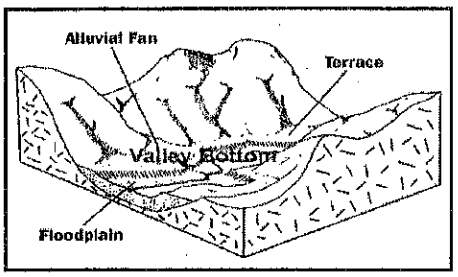


This landform occurs on steep, high relief mountain slopes underlain by inclined or folded sedimentary bedrock. Differential erosion and mass wasting was, and remains, the primary land forming processes. Slope shape is controlled by the orientation of sedimentary bedrock characterized by dip or scarp slopes or complexes. Ridges are very narrow and valleys typically are V-shaped. Slope gradients commonly greater than 35% with scarp slopes exceeding 60%. Slopes are dissected by a moderately high density of intermittent streams in a weak trellis to sub-dendritic drainage pattern. Channels are typically confined and moderately to deeply incised. Larger streams often follow dominant geologic structural trends.

This landform is associated with continental sedimentary rocks. Bedrock is comprised of structurally folded sedimentary bedrock of early Tertiary age. Rocks are derived from

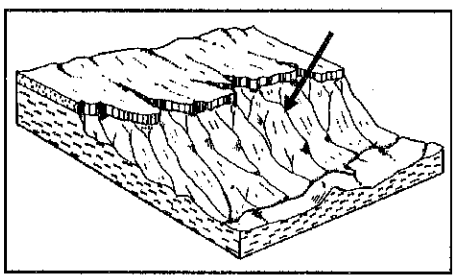
consolidation of continental sediments that were rapidly deposited into large fault-controlled basins. Lithology is primarily medium to coarse grained mica and feldspar-rich sandstones commonly interbedded with siltstone and shale with minor conglomerate and volcanic units. Bedding ranges from thin interbeds to massive cross beds. Bedrock structure and weathering resistance influences land shape; hillslope and hydrologic processes. Resistant and/or vertical beds form ridges. Less resistant rock readily weathers to shallow, sandy to fine sandy loam soils.

Valley Bottoms/Outwash



This landform occurs on nearly level terraces and floodplains in broad valley bottoms. Glacial/fluvial outwash deposition was the primary land forming process. Slopes gradients range from 0 to 20% and are generally less than 10% and are dissected by high energy, low gradient, perennial streams. Stream channels most commonly meander but may be braided in some reaches. Substrate is usually comprised of stratified sand to cobble size material but very large boulders are not uncommon. Ponds, marshes and overflow channels may occur. Valley bottoms are subject to frequent flooding. Subsurface and in-stream flow may be in continuity. Included within this landform are alluvial fans and colluvial deposits located along the valley sides.

Moderately Steep Volcanic Flows



This landform occurs on moderate to steep hillslopes with smooth convex ridges and flat bottomed valleys. These landforms have been shaped by fluvial erosion on volcanic and pyroclastic flows. Slope gradients ranges from greater than 20 percent to over-steepened escarpments exceeding 45 percent.

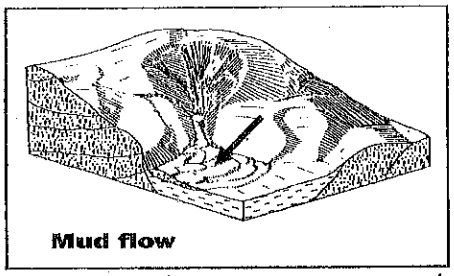
This landform is associated with 2 types of rocks basalt rocks – interbedded and pyroclastic rocks.

Basalt rocks – interbedded bedrock is formed from multi-layers of basaltic lava flows extruded in the early to mid Miocene. Accumulating to over 1,000 feet, this rock unit is structurally segmented by columnar jointing and interbeds of weakly cemented sedimentary and pyroclastic deposits of the Ellensburg formation. Bedrock is relatively resistant and weathers to clay loam soil textures. Plateaus and broad structurally folded ridges are common landforms.

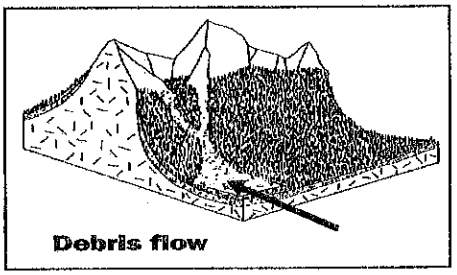
Pyroclastic rocks bedrock is comprised of a complex mix of, often interstratified, rocks from mid to late Tertiary volcanic flows, interbedded with pyroclastic flows, ash fall deposits, tuffs, breccias, volcaniclastics, and volcanic rich sandstones. Lahar and debris

flow deposits are common. Commonly, strata are deeply weathered with areas of more resistant facies or beds. This group also includes local metamorphic rock units with similar weathering characteristics and other management concerns. Typically, these rocks weather to moderately fine and fine textures.

Landslide Undifferentiated



This landform occurs on lower gradient slopes consisting of benches and/or an irregular pattern of mounds and depressions. Landforms are the depositional areas of shallow rapid and sporadic semi-shallow mass wasting. Landslides originate in relatively cohesive soil, weathered bedrock, or glacial till deposits. Slope gradients range from 20 to 45%. Drainage patterns are typically deranged or contorted in the area of landslide deposition. Channels are generally poorly defined but can be entrenched where well developed. Subsurface and surface drainage divert water to depressions. Seeps and springs are common. Surface runoff and sediment commonly contained within the unit except where streams are entrenched.



This landform is associated with undifferentiated rock materials. This geology group consists primarily of surficial deposits such as glacial till, alluvium, landslide deposits, and glacial outwash. These deposits are generally of Pleistocene age or relatively young. Surficial deposits have non-rock matrix which varies in grain size mixed with rock fragments transported from a diversity of origins. Transport mechanisms determine whether material is poorly sorted or well sorted in terms of grain size distribution. Rock types are varied. Soil textures usually reflect the non-rock matrix texture and can vary from coarse to moderately fine.

General Soils

General soils in the project area are moderately deep, deep and very deep composed of colluvium and residuum from basalt or silt/sandstone with an admixture of volcanic ash. They typically have a coarse textured surface of loamy sand and sandy loam (volcanic ash) with 0 to greater then 35 % rock fragments by volume. These types of soils have tendencies to become compacted. The subsoil layers are a product of the bedrock they formed from, basalt rocks become finer soils of clay loams and/or clays, those composed of sandstone become coarser texture soils of sandy loams. Drainage class for most soils is well drained. Slopes range from 0 to 60 percent. Moderate to steep slopes with the mixture of volcanic ash in the topsoil make these soils highly erodible. For more information, see web soil survey for Kittitas County.

The soil moisture regime is xeric, defined in Keys to Soil Taxonomy 9th Edition, 2003. Ground cover is effectively controlling erosion. Fine organic matter thickness ranges

from 1 to 3inches. Coarse woody debris exceeds R6 guidelines of 5 to 10 tons/acre (Tepler Field Notes, 2008).

Bedding Grounds
Bedding grounds are where impacts from grazing occur. Soils of the bed grounds are compacted. Ground cover is approximately 90 percent. Observations of the bed grounds concluded no erosion occurring (Tepler Field notes 2008).

Detrimental Soil Disturbance (Compaction, Displacement, Puddling and Severely Burned soil)
Timber harvest and fuels treatment activities in the past have caused detrimental disturbance in the form of soil compaction, displacement and severely burned soil. Soil compaction occurred from the use of ground-based equipment. The degree of compaction and the extent of soil damage is dependant upon type of equipment used, season of operation, soil moisture at the time of operation, volume of harvest, and the administration of the harvest operation. Displacement occurs with the turning of equipment on hillslopes, building of temporary roads and landings. Severely burned soil occurs under timber slash that is piled and burned, and sometimes under logs. Detrimental disturbance in the analysis area is less than 20 percent of the activity area acres (Tepler field notes).

Soil Erosion
During the past several hundred years, the majority of surface erosion occurred when the soil was bared by consumption of litter, duff, and woody debris by fires. On droughty aspects, the natural burns were frequent but of low intensity. Vegetation adapted to this fire regime responding to the flush of nutrients that occur after a fire, and in a couple of years, much of soil surface has protective vegetative cover. During the recovery period, erosion is common. Occasionally on these slopes the shallow soils would become saturated by rapid snowmelt, heavy rain, or rain on snow events and be prone to rapid debris avalanching. The occurrence of episodic severe rilling/gullying closely associated with debris flows down steep draws occurred under natural historic disturbance conditions. Most soils in the project area are rated severe or moderate for erosion hazard.

In recent times, since development of watersheds by roading and timber harvest, the dominant erosion processes in the roaded portions of the project area is surface erosion from the bare soil of roads, including the cutslope, fillslope, and travelway. Roads can provide a chronic, long-term source of sediment to streams within the analysis area. Rilling, and raveling of steep disturbed slopes of the road prisms are common on droughty slopes. The revegetation of the cutslope and fillslope are difficult because of lack of soil moisture and organic material and drying up of seeds and seedlings. Much bare soil often remains on these sites even after reseeding occurs. Erosion of the roadway cut and fill slopes are accelerated. On droughty slopes most of the road prism has zero to very low productivity of plant biomass. Forest Service system roads can be considered land removed from production. On more moist slopes, revegetation efforts are more successful and erosion of road cut and fillslopes is lower.

Organic Matter
Organic matter in its various forms contributes to soil productivity. It provides a carbon and energy source for soil microbes, stabilizes and holds soil particles, improves the soil's ability to store and transmit air and water, stores and supplies nutrients (U.S.D.A. Natural Resources Conservation Services 1996). Duff and litter are partially decomposed leaves, needles, and twigs on the surface of soils. Fine organic matter thickness varies in the activity area from no organic matter to 3 inches thick. Large woody debris consists of woody stems greater than three inches in diameter. Decomposed large woody debris forms long lasting high moisture microsites after the soils dry out.

Mass Failure or Soil Stability
Mass failures can be caused by either natural or human-caused disturbances. Mass failures sometimes occur when soils are saturated or are nearly saturated with water from natural events such as precipitation or melting snow. Man's activities can also saturate a soil by channeling water and concentrating it onto a limited area such as below a road culvert or a rutted skid trail. Mass failures triggered by human causes are detrimental soil disturbances. These disturbances cause long-term changes in soil productivity that last decades. Natural mass failures are not detrimental soil disturbances.

Soil Moisture Regime
The term 'soil moisture regime' refers to the presence or absence either of ground water or of water held at a tension of less than 1500 kPa in the soil or in specific horizons during periods of the year. Water held at a tension of 1500 kPa or more is not available to keep most plants alive. A horizon is considered dry when the moisture tension is 1500 kPa or more and is considered moist if water is held at a tension of less than 1500 kPa but more than zero. Soils in the activity areas have a xeric moisture regime. The xeric moisture regime is the typical moisture regime in areas of Mediterranean climates, where winters are moist and cool and summers are warm and dry.

Soil and Site-productivity Environmental Consequences
The analysis area is the lands within the project boundary for the direct, indirect and the cumulative effects. This analysis area was selected because that is where the effects of implementing the proposed activities would occur. The percentage of acres of the activity area in detrimental soil disturbance after completion of project was used to measure the effects of the alternatives. The rational for using this measure is based on direction found in the Wenatchee Forest Plan in that not more than 20 percent of an activity area may be in a detrimental soil condition following management activities

Management activities can result in direct and indirect effects on soil resources. Direct and indirect effects may include alterations to physical, chemical, and/or biological properties. Physical properties of concern include change in structure, density, porosity, infiltration, permeability, water holding capacity, depth to water table, surface horizon thickness, and organic matter quantity and distribution. Impacts known to cause the greatest adverse effects on soil physical properties include soil compaction, displacement, puddling, burning, erosion, and mass wasting. Direct effects of management activities commonly include compaction, displacement, puddling, and burning. Erosion, mass

wasting, and changes in water table, soil biology, organic detritus recruitment, and fertility (such as the fertilization effects of ash after a light-intensity fire) usually occur as indirect effects. Direct and indirect effects of the alternatives and associated activities on soil resources will be analyzed in terms of soil productivity

Soil Productivity

Soil productivity is the ability of the soil to supply the water and nutrients needed to sustain plant growth. Soil productivity is maintained when:

- *Detrimental soil disturbance* levels are below 20 percent of the activity area's acres including system roads and trails.
- *Organic matter* is maintained in amounts sufficient to prevent short or long-term nutrient and carbon cycle deficits and to avoid detrimental physical and biological soil conditions.

  Fine Organic Matter

  Maintain thickness and distribution over activity area

  Coarse Woody Debris

  Maintain minimum logs, or branches, per acre according to potential for ecological type, or groups of similar types.
- *Soil erosion* meets acceptable levels of soil loss and soil management
- *Mass failures* are not triggered by management. These disturbances cause long-term changes in soil productivity that last decades. Natural mass failures are not detrimental soil disturbances.

Cumulative effects will be considered for all past, proposed, current and reasonably foreseeable activities listed in Chapter 1 and are described at the end of this section. The primary concern is the impact of direct and indirect effects of management activities on soil productivity and disturbance.

The analysis of effects for soils assumes that all practices outlined in Chapter 2, Design Criteria, would be implemented and would be effective. The analysis will show the expected amount of soil disturbance resulting from the implementation of the alternatives, and will describe the consequences of that the expected amount of disturbance.

Direct and Indirect Effects of the No Grazing Alternative (Alternative 1) on Soil and Site-productivity

This alternative would not authorize grazing on the Swauk Allotment. The effects on soils are discussed as changes over time on soil productivity (organic matter, (groundcover and large woody material), and soil erosion) and soil disturbance (detrimental compaction, displacement, puddling).

Direct Effects

Detrimental Disturbance

Current compacted areas would most likely recover very slowly. The rate of recovery of compaction is still not well defined, but it appears that the compacted conditions persist for decades. Most improvements occur between 20 to 40 years (Lull 1959, von Wilpert

and Schaffer 2006). However, wheel tracks made by wagons over a hundred years ago are still compacted (Lull 1959).

Fine Organic Matter, Coarse Woody Debris (CWD) and Groundcover
The No Grazing Alternative would not affect CWD, current levels will increase as trees fall to the ground. Soil organisms would slowly decompose the organic materials, adding beneficial humus to the soil. Nutrients associated with this material would slowly become available for plant growth. Fine organic matter would not be affected. Ground cover (organic litter, rock and vegetation) would be maintained at current levels sufficient to control accelerated erosion.

Erosion
Current levels of erosion would continue. These levels are not accelerated.

Soil Moisture Regime
No new compaction is going to occur therefore soil moisture regimes would remain unchanged.

Mass Failures
Natural mass failures would continue. Literature and research studies have not linked mass failures with livestock grazing.

Effect of the Current Management Scenario (Alternative 2) and Adaptive Management (Alternative 3) on Soil and Site-productivity
Livestock grazing can have detrimental or minimal effects to soils. Heavy concentrations of animals tend to compact soils. These areas are usually trails, water developments, bed grounds and corrals. Overgrazing can cause erosion from vegetation loss. Because sheep grazing is controlled by herding it is possible to graze without causing detrimental effects (Platts, 1981). Controlled grazing may enhance watershed characteristics, 15 years of moderate cattle grazing in northeast Oregon resulted in improved watershed mulch and vegetative cover. There was no difference in surface erosion between properly grazed and ungrazed areas (Holechek, 1980). Some studies have failed to show a difference in soil loss, infiltration rates or soil bulk density among light, moderate and ungrazed pastures (Blackburn, 1983).

Direct Effects
Detrimental Disturbance
Bedding grounds, trails and some cut and fill slopes of roadswill stay in detrimental soil conditions. Not allowing livestock to graze until soils are dry may not eliminate new compaction, this is because poorly graded coarse soils with non-expanding clay minerals (like the soils in the project area) compact to similar bulk densities regardless of moisture content (Froehlich and McNabb, 1983) and ashy soils tend to compact when dry. Having a herder accompany the livestock, loose herd trailing and staying only 2 nights at a bedding ground will allow greater distribution of the livestock thereby not having the impacts of sheep congregating in any one area.

Fine Organic Matter, Coarse Woody Debris (CWD) and Groundcover
Fine organic matter thickness may be affected from loss of vegetation in the small open "meadow" areas but overall fine organic matter would not be effected. Coarse woody debris levels would remain the same and likely increase. Groundcover may at times be below levels to control erosion because of the loss of the vegetative component but on average the groundcover will meet Regional and Forest Plan standards.

Erosion
Trails and some cut and fillslopes of roads will continue to erode but the amount of erosion would not increase because trails are re-used (no new trails are created).

Soil Moisture Regime
No new compaction is going to occur over an extensive area therefore soil moisture regimes would remain unchanged.

Comparison of Alternatives

Alternative 1-No Grazing

Less than 20 percent of the activity area in detrimental disturbance with disturbances diminishing
Fine organic matter thickness remains the same
CWD 5 to 10 tons per acre
Groundcover sufficient to control erosion
Erosion diminishes
Soil moisture regimes remains within natural conditions

Alternative 2 – Current Management Scenario

Less than 20 percent of the activity area in detrimental disturbance with no disturbances diminishing
Fine organic matter thickness remains the same
CWD 5 to 10 tons per acre
Groundcover sufficient to control erosion
Erosion does not diminish
Soil moisture regimes remains within natural conditions

Alternative 3 – Adaptive Management

Less than 20 percent of the activity area in detrimental disturbance with no disturbances diminishing
Fine organic matter thickness remains the same
CWD 5 to 10 tons per acre
Groundcover sufficient to control erosion
Erosion does not diminish
Soil moisture regimes remains within natural conditions

Cumulative Effects on Soil and Site-productivity
The activity area was selected for the analysis of cumulative effects. It was chosen because no issues were brought forward internally by Forest Service specialist or the

public referring to watershed disturbance and it is the area the proposed project would have the greatest effect upon. The cumulative effects analysis area is described above in the Affected Environment section.

Past, Present and Foreseeable Effects

Past effects to the soil resource are from grazing, roads, road maintenance, recreation, timber harvest and prescribed fire. Roads are the largest contributor to detrimental disturbance with recreational user-created trails and campsites next. Both have compacted and eroded soil. However, the amount of erosion and soil taken out of the productive soil base is a small percentage of the project area. Timber harvesting has caused effects like those described in the Environmental Consequences section.

Present activities to the soil resource are grazing, road maintenance, and recreation. These effects are not having a substantial impact because they are occurring on existing sites and are a very small portion of the watershed.

Foreseeable activities are grazing, road maintenance, recreation. No new roads are planned but roads continue to erode. Road maintenance causes a spike in erosion at the time but diminishes over time. Recreation activities will increase as the population of the area increases. These effects will not have a substantial impact and are a very small portion of the watershed.

The No Grazing alternative would not have any cumulative effects on the analysis area because no new disturbance would occur and the impacted area would slowly recover.

The Current Management Scenario (Alternative 2) and Adaptive Management (Alternative 3), when combined with past, present and foreseeable future effects would not have any cumulative effects on the area. Existing disturbance would remain, no new disturbance would occur.

Compliance with Regulatory Framework; Wenatchee Land Resource Management Plan (WLRMP), and Regional Direction

For all alternatives the percentage of detrimental disturbance would not reach the threshold value (20%) where soil productivity might be impacted. Ground cover would be sufficient to control erosion. Organic matter depth would not decrease. Erosion would not be at levels considered detrimental. The soil moisture regime would not change. Long-term soil productivity would be maintained and all Standards and Guidelines would be met with all alternatives.

Vegetation Affected Environment

The Wenatchee National Forest Land and Resource Management Plan (1990) establishes the Swauk Sheep Allotment as suitable for domestic livestock grazing. Within the Swauk Allotment Management Plan analysis area, 95 percent of the upland area is considered to be suitable range for livestock grazing (Table III-4). For the purposes of this analysis, suitable range refers to land that is accessible or that can become accessible to livestock,

that produces forage or has inherent forage-producing capabilities and can be grazed on a sustained-yield basis under reasonable management goals (FSM 2210.5). Suitability further refers to the appropriateness of implementing grazing on any particular area of land as determined by this environmental analysis. Specific suitability criteria used for this analysis include: all forested and non-forested vegetation types with greater than 50 lbs/acres average forage production, all forested vegetation types with less than 55 percent canopy cover, all soil types, and all slopes less than 60 percent (Map III-2, Appendix A). Forested areas with greater than 55 percent canopy cover, rock, water, and other vegetation types not typically utilized by domestic livestock to any significant degree were not considered suitable range for the purposes of calculating suitable acres and the associated average forage production. Although suitable, in most cases, for grazing by domestic livestock, the acres of riparian area were also excluded for the purposes of calculating forage production. The amount of forage produced within riparian areas is in addition to that amount displayed later in this document (Table III-4).

The plant communities described in Table III-3 below, represent the primary ecosystems grazed within the Swauk Allotment analysis area and consequently, the plant communities most likely to be affected by continued domestic sheep grazing.

Table III-3: Primary Ecosystems Grazed within the Swauk Allotment Analysis Area

Vegetation	Description
Forested Communities	Dry, mesic and wet forest communities dominated by ponderosa pine, Douglas-fir, grand fir, and sub-alpine fir with less than 55 percent canopy closure. Transitory range (forested areas that are grazed following timber harvest or fire until such a time as the new tree canopy closes and understory production declines) provides a significant component relative to these plant communities; particularly in the mesic and wet community types where increased canopy closure precludes significant understory productivity.
Shrublands/Lithosols	Communities characterized by a dominance of persistent, woody, multi-stemmed vegetation with a relatively low growth habit. Shrublands often occur on fragile, shallow, poorly developed soils prone to droughty conditions. Semi-arid conditions associated with these sites often result in a shortened growing season. These communities occur at low elevations and at higher elevations within the sub-alpine fir zone.
Grasslands and Meadows	Grasslands and meadows are communities, typically interspersed within forest communities, which are occupied by grass, grass-like species and forbs. Sites supporting these communities range from areas with standing water supporting a continuous vegetation canopy comprised of sedges, reeds and moss to more well-drained areas dominated by sedges, grasses and forbs. The driest sites typically contain no standing water and support sedges, grasses and forbs adapted to more xeric conditions. Hydrologic regime, humidity and exposure (insulation and evaporation) are key factors in the functioning of these ecosystems
Riparian communities	Riparian areas occur on the banks and shorelines of rivers, creeks, and ponds. These communities are discussed in more detail previously in this document.

There is little doubt that soil and vegetation disturbances associated with past and present activities such as fire and fire suppression, timber harvest, ungulate grazing and recreation have influenced the present condition of the existing vegetation. Historically, the vegetation in the dry forest types was maintained by the occurrence of frequent, low intensity fire. This process functioned to reduce the number of smaller diameter trees and promoted the development of widely-spaced large diameter trees with a vigorous understory of grasses, forbs and shrubs (Agee 1993, Agee 1994). Over the last approximately 100 years, fire suppression and selective timber harvest have allowed for the development of dense, multi-layered forest communities composed primarily of smaller diameter trees (Hessburg et al. 1994). These conditions have generally resulted in declining growth and reduced vegetative vigor of the associated understory component (Agee 1993, McConnell and Smith 1970) and consequently, a corresponding decrease in forage production (i.e., production of those species utilized by domestic livestock or wild herbivores). It is also reasonable to assume that these and other activities have had an important influence on the abundance and distribution of species within these forest communities. Post timber harvest activities such as the seeding and planting of selected species for erosion control and watershed restoration has resulted in the introduction of cultivated varieties and non-native vegetation into these systems. Ungulate grazing has further influenced the distribution of vegetation within the analysis area. The repeated defoliation of selected vegetation by herbivores over time has resulted in an apparent decline in shrub species such as snowberry, serviceberry, rose, currant, balsamroot and others. The reduction of individual species in response to long-term grazing in general is well documented in the literature (Shiflet 1994, Miller et al. 1994, Franklin and Dyrness 1973).

Given the disturbance history associated with the analysis area, it is also to be assumed that the plant community composition of shrublands, grasslands and meadow communities has also been influenced by altered fire return intervals and long-term grazing. Longer fire-free intervals, in combination with grazing, have provided an opportunity for tree enchroachment into adjacent shrublands, grasslands and meadows in some areas. An increase in canopy cover at the edges of historically non-forest plant communities, likely, has resulted in some reduction in the productivity of these communities. Increases in shrub densities and subsequent changes in the grass and forb components associated with these ecosystems are also apparent in some locations. It is not uncommon to observe patches comprised of primarily older age-class shrub species with low vigor above a relatively depauperate understory. The microphytic crust is discontinuous or lacking on many sites. Past physical disturbance of these sites has contributed further to changes in species composition resulting in colonization by noxious weeds and other invasive annual species such as tarweed and cheatgrass. Continued physical disturbance in some areas has maintained a weed seed or plant material source, created safe sites for plant establishment, and provided for effective dispersal of propagative material to other locations in the analysis area. Generally within the analysis area, noxious weed infestations are associated with roads and other travel corridors, gravel pits, previously used log landings, logging skid roads, slash piles, sheep bedgrounds, sheep loading and unloading sites, dispersed campsites and other high use recreation areas.

Overall, the condition of the mesic and wet forest plant communities within the analysis area has been less influenced by the combined effects of fire, fire suppression, timber harvest and ungulate grazing. Most significant relative to this analysis, are the reduction in the number of acres harvested and the corresponding decrease in the proportion of the area that supports forested vegetation with less than 55 percent canopy closure. Over time, as the amount of newly harvested area has decreased and previously harvested areas have regenerated, the understory productivity associated with these areas has likely decreased with a corresponding decrease in forage production (i.e., production of those species utilized by domestic livestock or wild herbivores).

The important vegetation groups present within the Swauk Allotment, the number of acres of suitable range of each type and the average forage production is displayed in Table III-4, below. Maps III-1 and III-2, Appendix A display the vegetation type and suitable range within the allotment.

Table III-4: Vegetation Groups, Suitable Range and Forage Production in the Swauk Allotment

	Swauk Allotment (46,077 acres)		
Vegetation Group	**Total Acres within Vegetation Group**	**Suitable Range (acres)**	**Forage Production (average lbs/yr)**
Non-forest	4,434 (9.6%)	1,976	1,563,016
Ponderosa pine Douglas-fir and grand fir	30,033 (65.2%)	13,678	10,931,344
Moist grand fir	9,931 (21.6%)	3,967	4,477,390
Subalpine fir and parkland	1,599 (3.5%)	1,573	393,250
Deciduous forest	79 (<1%)	0	0
Total*	46,076	21,194	17,365,000

*Forested areas with greater than 55 percent canopy cover, rock, water and deciduous/riparian areas within the allotment are not considered suitable.

Currently documented site-specific locations with the greatest sensitivity relative to upland ecosystem health on the Swauk Allotment include areas along Williams Creek (T20N. R17E. Section 11), Pine Gulch (T20N. R17E. Section 11), Iron Creek (T21N. R17E. Section 10), and the area in the vicinity of Red Top Mountain (T21N. R17E. Section 19).

Forage Production

Over the past 30-40 years, an overall reduction in the number of acres of timber harvested and large-scale wildfire events has resulted in the development of forested plant communities that support dense overstory canopies and consequently, less productive and diverse understories due to shading (refer to previous section). This has subsequently resulted in a decline in the amount of forage produced. Further, longer fire-free intervals in combination with the effects of long-term grazing have contributed to tree encroachment into adjacent shrublands, grasslands, and meadows, contributing further to increases in overstory density and subsequent decreases in the shrub, forb, and grass

production associated with non-forested plant communities. Conversely, current dry forest management in combination with more recent management direction relative to restoration of fire dependent ecosystems will likely contribute to increased forage production over time.

By definition, suitable range must produce adequate forage for watershed related values (e.g., soil protection water quality, etc.) while also sustaining livestock grazing. Current management guidelines (U.S.D.A. Forest Service, Wenatchee National Forest 1990) allocate, on the average, 40 percent (30 to 50 percent) of the annual forage production to grazing ungulates, including permitted livestock. This allocation is referred to as allowable use.

Forage production was estimated for each plant community group within the analysis area using two consecutive years (1999, 2000) of productivity data collected from caged and clipped plots from similar plant communities on the Leavenworth and Naches Ranger Districts. Published productivity data from comparable vegetation types was also included in calculating the average forage production values displayed in Table III-5, below.

Table III-5: – Forage Production, Allowable Use, Forage Required by Livestock and Forage Available for Other Ungulates for the Swauk Allotment

Allotment	Average Forage Production (lbs/yr)	60% Retained for Watershed Health	Allowable Total Use (40% of average annual production)	Forage required for currently authorized domestic livestock (lbs/authorized season of use)*	Forage available for other grazing/browsing ungulates (lbs/yr)
Swauk	17,365,000	10,419,000	6,946,000	806,000	6,140,000

* 1 ewe sheep w/lamb requires 260 lbs of forage/month. Refer to Chapter II for authorized number and season of use.

A broad-scale analysis of total forage production, allowable use consistent with WNF standards and guidelines (40%), and the amount of forage required for the currently authorized number of livestock and season of use suggests the presence of adequate forage for permitted livestock, in addition to forage for other ungulates. It is important to note however that there are a number of assumptions associated with the above analysis as it assumes that animal use is distributed evenly across the landscape and that forage production is distributed evenly over the growing season (May-October). Further, the model does not consider preference for or nutritional value of individual plant species.

Invasive Plants

Invasive plants are aggressive, competitive, highly destructive and difficult to control. They are often introduced through human actions. These plants are introduced without the natural controls that keep populations in check in their native habitats. Invasive plants frequently create monocultures that can lead to increased wind and water erosion; decreased capture, storage and proper release of precipitation; and altered nutrient cycling

by out-competing the native plant community. Invasive plant monocultures further reduce diversity by displacing animals that depend on native plants for habitat and food. Invasive plants thrive in highly disturbed sites such as river and stream banks, trailheads, roadsides, burned areas, logging sites and trails (Sheley et al. 1996).

The Washington State Noxious Weed list is updated yearly and classifies weeds in three categories A, B, and C based on current invasive plant distribution. Each category provides strategies for management, both suggested and those required by law. Class A weeds have a limited distribution; preventing new infestations and eradicating existing infestations is the highest priority. State law requires eradication of Class A weeds. Class B weeds are limited to portions of the state and are controlled in places where they are not yet widespread. Control is decided at the local level with containment as the primary goal for Class B weeds. Class C weeds are widespread across the state. The USFS uses this list to prioritize invasive plant treatments.

There are known infestations of thirteen Washington State listed noxious weed species within, on the approach to, or otherwise threatening the Swauk Allotment.

Table III-6 – Documented Noxious Weed Occurrence in the Swauk Allotment

Scientific name	Common Name	WA State Classification
Carduus nutans	musk thistle	B
Centaurea biebersteinii	spotted knapweed	B
Centaurea debeauxii	meadow knapweed	B
Centaurea diffusa	diffuse knapweed	B
Cynoglossum officinale	houndstongue	B
Leucanthemum vulgare	oxeye daisy	B
Linaria dalmatica	Dalmatian toadflax	B
Potentilla recta	sulfur cinquefoil	B
Artemisia absinthium	absinth wormwood	C
Cirsium arvense	Canada thistle	C
Cirsium vulgare	bull thistle	C
Matricaria perforata	mayweed	C
Tanacetum vulgare	common tansy	C

Most populations are found along roadsides, on the edges of stands, and in open meadows. Knapweeds have infested areas beyond the roadsides. Houndstongue has also been found inside several stands.

Small-scale efforts over the past 10 years have been made at invasive plant control using herbicide along roadsides and in the heliport area at Liberty, the location of the sheep turnout.

Vegetation Environmental Consequences

The range allotment is the analysis area considered when assessing the effects of the proposal on the vegetation. Direct effects would only occur in the immediate vicinity of the route and bedgrounds where livestock physically travel. Indirect effects could also be realized in the area immediately adjacent to the route.

Effect of the No Grazing Alternative (Alternative 1) on Vegetation
The No Grazing Alternative (Alternative 1) would eliminate domestic grazing-related disturbances to the soil and vegetation resources. One currently accepted conceptual range condition model suggests that, in general, communities that evolved under some degree of grazing, such as most grassland communities, may be relatively resistant to deterioration caused by grazing; and when degraded, improve rather quickly when grazing is eliminated or reduced (Laycock 1994). Ellison (1960) and Sneva et al. (1984) observed increases in native herbaceous species where livestock have been removed or intensively managed. Hoffman and Wambolt (1996) reported that plants excluded from grazing were generally more vigorous than plants which were grazed. Under this scenario, the No Grazing Alternative (Alternative 1) has the potential to result in relatively rapid improvement in upland ecosystem health of areas currently experiencing domestic grazing-related impacts. It can be assumed that under the No Grazing Alternative, the intensity of herbivory and associated activities (e.g., trampling) would decline in areas currently utilized by both domestic and wild herbivores. It is not clear however, to what degree grazing must be reduced to elicit the documented response, and if removal of grazing by domestic sheep only would be sufficient to initiate a significant change.

In contrast, more recent "threshold" and "stable state" models suggest that plant communities may be resistant to change up to a threshold, beyond which change be may rapid and irreversible (Archer and Smeins 1991). In some cases, a steady state condition may exist when the community is a recognizable, relatively stable assemblage of species occupying a site (Westoby et al. 1989, Holling 1973, May 1977, Wissel 1984, Malin 1955). Early successional steady states are common for shrub-dominated vegetation types on xeric sites (Young et al. 1979, Young 1994). Once the woody plants become dense with a reduced herbaceous understory, they can occupy a site for a very long period. Removal of livestock from these altered plant communities may not necessarily return them to a pre-grazed condition (Robertson 1971, Anderson and Holte 1981, Holechek and Stepheson 1983, West et al. 1984, Tisdale et al. 1969, Sanders and Voth 1983). Anderson et al. (1982) reported that as much as 18-29 years might be required for recovery of cryptogrammic crusts damaged by livestock grazing. Miller et al. (1994) further suggests that despite the removal of herbivores, little change should be expected on sites where exotic annuals, such as cheatgrass, limit the reestablishment of desirable plant species. Under the steady state scenario, the No Grazing Alternative (Alternative 1) would not necessarily result in improvement in upland ecosystem health of all impacted plant communities on all sites. Plant communities which have exceeded an ecological threshold would likely remain unchanged despite the elimination of domestic sheep grazing and associated activities.

In contrast to drier plant communities, most mesic mountain communities and riparian areas react somewhat predictably when grazing pressure is eliminated or reduced. It is well documented that the many riparian areas and mesic mountain communities have been depleted by heavy and prolonged livestock grazing; resulting in decreased vigor, biomass and changes in species composition (Laycock 1994). Because of the availability

of water, the herbaceous layer of these vegetation types often responds rather quickly to a removal or reduction in grazing pressure (Laycock 1994, Tiedemann and Berndt 1972). Again, it can be assumed that under the No Grazing Alternative, the intensity of herbivory and associated activities (e.g., trampling) would decline in areas currently utilized by both domestic and wild herbivores. It is not clear however, to what degree grazing must be reduced to elicit the documented response, and if removal of domestic sheep grazing only would be sufficient to initiate a significant change.

Cumulatively, the No Grazing Alternative (Alternative 1) would contribute to an overall reduction in the amount and intensity of grazing within the analysis area. Concurrently, dry forest management activities would increase the amount of available forage over the long-term by reducing the forested overstory and subsequently promoting the development of a more vigorous and diverse understory component.

The rate of introduction and spread of invasive plant species would likely be less than with sheep grazing. There would be an increase in understory vigor, a reduction in ground disturbance associated with grazing and Prone less vector for invasive plant dispersal.

Effect of the Current Management Scenario (Alternative 2) on Vegetation
The Current Management Alternative (Alternative 2) would result in the Forest continuing to administer the Swauk Sheep Allotment under the current management scenario. Under this alternative, impacts relative to upland ecosystem health which are associated with domestic sheep grazing would continue to occur as described previously in this document. The current management scenario does not provide an opportunity to address the previously identified need to maintain or improve upland ecosystem health as related to domestic livestock grazing. Further, this alternative does not ensure that authorized grazing complies with applicable federal environmental laws, regulations and Service policies and procedures, specifically in relation to forest plan standards and guidelines.

Site-specific locations of concern along Williams Creek (T20N. R17E. Section 11) and in the area of the Pine Gulch crossing (T20N. R17E. Section 11), Iron Creek(T21N. R17E. Section 10), and fragile lithosol communities in the vicinity of Red Top Mountain (21N. R17E. Section 19) would continue to experience a stable or downward trend with respect to desirable plant species composition and/or plant community structure. Degraded areas would continue to be vulnerable to noxious weed infestation as, little if any, improvement in the conditions that contribute to the establishment and spread of noxious weeds would be anticipated. The vigor and overall productivity of species understory forbs and grasses would remain as it is currently or continue to decline. Implementation of this alternative would result in sustaining the specific effects identified previously in greater detail under Purpose and Need, Important Interactions and Terrestrial Ecosystem Health, Existing Vegetative Conditions.

Under Alternative 2 (Current Management Scenario), it is expected that cumulative effects would continue to occur, primarily, as a result of on-going and foreseeable future

actions, such as grazing by wild ungulates and dry forest management activities (e.g., thinning from below and fuel reduction). The cumulative effects of continued grazing over time are described in detail under Purpose and Need, Upland/Terrestrial Health, Important Interactions and Upland/Terrestrial Health, Existing Vegetative Conditions. Dry forest management activities are expected to increase the amount of available forage over the long-term by reducing the forested overstory and subsequently promoting the development of a more vigorous and diverse understory component.

With respect to invasive plants, degraded areas would continue to be vulnerable to invasive plant invasion. The required standards and best management practices would reduce impacts to some degree, however, there is no foreseeable change in the present list of vectors of invasive plant spread (vehicles, including jeeps and motorcycles, people, wind, wildlife, and domestic sheep). The extensive use by domestic sheep in this area dates back to 1907. The number and length of grazing periods have been reduced since then, but domestic sheep would continue to be a vector for invasive plant spread. The current rate of introduction and spread of invasive plant species would likely continue. Through implementation of the Okanogan-Wenatchee National Forests Noxious Weed Preventions Strategy and Best Management Practices, and consistency with the Record of Decision for the Pacific Northwest Region Invasive Plant Program (2005) standards and guidelines the current management scenario is consistent with the Forest-wide Assessment for Late-Successional Reserves and Managed Late Successional Areas (1997) with respect to invasive species. Cumulatively, this action in combination with the proposed forestwide invasive species treatment project would, over time, likely result in a reduction in the rate of spread of invasive species associated with livestock grazing due to the implementation of the early detection/rapid response strategy identified in that proposal.

Effect of Adaptive Management (Alternative 3) on Vegetation
Implementation of the Adaptive Management Alternative (Alternative 3) would address the need to maintain and improve upland vegetation conditions related to domestic sheep grazing. The proposed management strategy presents an array of options to mitigate potential adverse impacts of livestock grazing on upland vegetation and special and unique plant communities. This strategy would provide for the management of known livestock-related issues relative to plant community composition, structure and productivity through the modification, elimination and/or reestablishment of grazing routes and associated bedgrounds away from presently degraded areas and areas susceptible to adverse impacts.

Rerouting the grazing routes and relocating beds and other activities away from sensitive locations would likely result in an improvement in plant species composition and structure in identified areas of concern, over time by reducing the overall intensity, duration and frequency of grazing at these individual locations. A site that supports a more desirable species composition is also more likely to resist the establishment and spread of noxious weeds and other undesirable vegetation. The Adaptive Management Alternative also provides for the restoration of previously disturbed plant communities along grazing routes and at bedding areas. The management flexibility provided by this

alternative would also enhance the likelihood that past and on-going restoration efforts would be successful. Alternative 3, presents the opportunity to capture potentially available forage by providing for both key travel routes and secondary routes. Most importantly, this alternative would allow for the modification of management strategies needed to respond to changing conditions and unexpected outcomes across a relatively large landscape area over time. The monitoring framework provided by this alternative further ensures the opportunity for administrators to effectively respond to changing conditions or ineffective management strategies.

With respect to the site-specific effects of this alternative on upland ecosystem health issues identified previously in this analysis, Alternative 3 (Adaptive Management Strategy) reduces the likelihood of adverse impacts to riparian areas along Williams Creek (T20N. R17E. Section 11) and in the area of the Pine Gulch crossing (T20N. R17E. Section 11). Alternative 3 also would reduce the potential of adverse impacts to restoration areas, particularly Iron Creek 601 Road (T21N. R17E. Section 10), and Pine Gulch (T20N. R17E. Section 11) by rerouting the grazing and bedding areas to adjacent, less sensitive mid-slope and ridge-top positions. This alternative also provides for specifically locating trailing and bedding activities away from fragile lithosol communities in the vicinity of Red Top Mountain (21N. R17E. Section 19).
Under Alternative 3 (Adaptive Management), it is expected that cumulative effects would continue to occur, primarily, as a result of on-going and foreseeable future actions, such as grazing by wild ungulates and dry forest management activities (e.g., thinning from below and fuel reduction). The cumulative effects of continued grazing over time are described in detail under Purpose and Need Terrestrial Ecosystem Health, Important Interactions and Terrestrial Ecosystem Health, Existing Vegetative Conditions. Because this alternative provides for the modification of management strategies needed to respond to changing conditions it would potentially result in lessening the adverse effects of grazing in key areas currently utilized by both domestic livestock and wild grazing ungulates. Cumulative effects would be reduced by routing the livestock away from identified areas of concern. Dry forest management activities are expected to increase the amount of available forage over the long-term by reducing the forested overstory and subsequently promoting the development of a more vigorous and diverse understory component.

Effects to the thirteen species of noxious weeds found in the project area would be similar to those described above under Alternative 2 (Current Management Scenario). The required Standards and Best Management Practices would reduce impacts to some degree, however; degraded areas would continue to be vulnerable to invasive plant invasion. The anticipated improvement in soil and vegetative conditions at previously identified locations would ultimately lower the risk that invasive species would occupy the site due to the reestablishment of desirable vegetation instead. However, there is no foreseeable change in the present list of vectors of invasive plant spread (vehicles, including jeeps and motorcycles, people, wind, wildlife, and domestic sheep). The current rate of introduction and spread of invasive plant species would likely not change measurably.

Through implementation of the Okanogan-Wenatchee National Forests Noxious Weed Preventions Strategy and Best Management Practices, and consistency with the Record of Decision for the Pacific Northwest Region Invasive Plant Program (2005) standards and guidelines the Adaptive Management alternative is consistent with the Forest-wide Assessment for Late-Successional Reserves and Managed Late Successional Areas (1997) with respect to invasive species. As the implementation of invasive species standards and guidelines is expected to prevent the introduction and further spread of invasive species, no cumulative impacts are anticipated to result from this proposal.

Cumulatively, this action in combination with the proposed forestwide invasive species treatment project would, over time, likely result in a reduction in the rate of spread of invasive species associated with livestock grazing due to the implementation of the early detection/rapid response strategy identified in that proposal.

Effect on Proposed, Endangered, Threatened and Special Status Plant Species
In conjunction with the planning of the proposed project, all required surveys for Proposed, Endangered, Threatened and Special Status Species plants were completed in 2005, 2006, and 2007 (Worthington 2008). Currently accepted species lists and required survey protocols were utilized (U.S.D.A. Forest Service 2004, U.S.D.A. Forest Service 2008, U.S.D.A. and U.S.D.I. 1997, U.S.D.A. and U.S.D.I. 1997a, U.S.D.A. and U.S.D.I. 1998, U.S.D.A. and U.S.D.I. 1998a, U.S.D.A. and U.S.D.I. 1998b, U.S.D.A. and U.S.D.I. 2001). There are no known Proposed, Threatened or Endangered plant species in the project area and there is no listed critical habitat for any listed plant species in the project area. Therefore, there would be no direct, indirect, or cumulative impacts to these species from any of the proposals identified here.

There are known populations of two Region 6 Sensitive plant species located within the allotment; clustered lady's slipper (*Cypripedium fasciculatum*) and Wenatchee larkspur (*Delphinium viridescens*). There are a number of populations of lady's slipper located adjacent to the route. Population sizes range from 2-100 stems. Soil types include gravel, sandy silt and cobble. Populations occur on mineral soil and in the duff layer and on more northerly and easterly aspects.

Clustered lady's-slipper is a terrestrial orchid. It is a long-lived perennial herb that is rhizomatous. The rhizomes are located approximately 3-7 cm below the soil's surface. Because of limited air circulation in forested habitats, seed dispersal is approximately 2 meters from the parent plant (Harrod, personal communication). Large animals carrying seeds in their digestive tracts are thought to disperse seed a further distance. The orchid requires a fungal partner for seed germination, development and long term maintenance (U.S.D.A. Forest Service, Wenatchee National Forest 2001). Because of the fungal relationship it is thought that the nature of the upper organic layers of the soil profile is an important environmental factor in the distribution of the plant.

Wenatchee larkspur is a tall, stout perennial with a heavy, rhizomatous rootstock. The population is located about 0.5 miles from the route in an open moist meadow. The site supports surface water or saturated upper soil profiles into early summer. This species is

a local endemic of the Wenatchee Mountains confined to a small total range and apparently a very specific set of habitat conditions. The known range extends from near Leavenworth, Chelan County southward to the Liberty area.

Effect of the No Grazing Alternative (Alternative 1) on Special Status Plant Species
Under this alternative no direct, indirect, or cumulative impact would occur to the known sites of clustered lady's slipper or Wenatchee larkspur from sheep grazing.

Effect of the Current Management Scenario (Alternative 2) on Special Status Plant Species
This alternative is not likely to affect the populations of clustered lady's slipper and Wenatchee larkspur because in their current location the populations have been avoided and continue to florish. The populations would be monitored yearly to ensure continued protection. Under this alternative no direct, indirect, or cumulative impacts are anticipated occur to the known sites of clustered lady's slipper or Wenatchee larkspur from sheep grazing.

Effect of Adaptive Management (Alternative 3) on Special Status Plant Species
This alternative is not likely to affect the populations of clustered lady's slipper and Wenatchee larkspur because the populations would continue to be avoided. The populations would be monitored yearly to ensure continued protection. Under this alternative no direct, indirect, or cumulative impacts are anticipated to occur to the known sites of clustered lady's slipper or Wenatchee larkspur from sheep grazing.

Rangeland Resources

Important Interactions
Livestock production is a major industry in the western United States, providing jobs and income for rural communities and generating millions of dollars for the regional economy. Livestock grazing provides beef, lamb, leather, wool and other products that are important to local, regional and national economics. Public land permittees are an important part of the local tax base, providing employment and patronizing businesses in town for feed, equipment, gasoline, and supplies. In addition, ranchers on public range pay fees to the Federal Government, which are shared with local counties for roads and schools, or go to the U.S. treasury (U.S.D.A. Forest Service 1989). The social and economic existence of many of the small towns throughout the western United States depends, in part, on livestock producers who operate on Federal lands.

The rangeland resource is important to individual livelihoods as well as societal and economic development. A permittees' economic life may be tied to the production of market goods such as that derived from grazing of livestock on National Forest administered lands. Public lands compliment private grazing lands and provide a significant portion of the total grazing. It is not uncommon for a livestock producer to depend on federal lands for a significant part of their seasonal grazing capacity.

Livestock grazing is a long-standing traditional use of public lands (White et al. 1985). Rural families, often living some distance from town, represent a cherished American way of life. The outdoor environment, long days, hard work, an affinity for the land and what it can produce are still a way of life for many (U.S.D.A. Forest Service 1989). Federal grazing permittees often have base property adjacent to Federal lands. In addition to managing their ranch operations, these permittees are often available to help stop poaching, vandalism, and fires, and to assist people in distress (U.S.D.A. Forest Service 1989).

The decision to authorize (and under what conditions) or not authorize continued grazing could result in adverse economic impacts to local permittees and a reduction in value to the local, regional and national livestock economy. This decision also has the potential to adversely affect traditional land use practices and long-standing relationships between permittees and the landscapes from which they derive their livelihood and sense of place.

Rangeland Resources Affected Environment

Livestock grazing in the Cascade Mountains and on the Wenatchee National Forest is well-documented (Carter and Holstine 1994, Irwin et al. 1994, Johnson et al. 1994, Oliver et al. 1994). Early reports indicate that cattle herds grazed across the Columbia Basin as early as the 1840s (Carter and Holstine 1994). By the 1870s, growing population centers from Portland, Oregon to Victoria, British Columbia relied upon the Columbia Basin for significant portions of their meat supplies. Snoqualmie and Naches passes were the routes most frequently traveled by stockmen from the Yakima and Kittitas valleys and elsewhere.

With regard to the summer range, most cattle grazing was by local settlers who lived within or adjacent to the Forest. They moved their cattle through the lower foothills around Wenatchee, Entiat, Ellensburg, Cle Elum, and further south. Ranchers in the vicinity of Ellensburg used the Manastash, Taneum, Swauk and Naneum drainages. Overall, these herds were small and their impact minor (Carter and Holstine 1994). In contrast, sheep were driven from more distant locations, moving into the woods in early spring and remaining there until fall. Sheep grazed the slopes above the Yakima River south of Cle Elum, in the Teanaway, on the ridges extending from the Columbia River westward to Mount Stuart and on the south slope of Mount Stuart. During the time period of 1876-1896, much of the Cle Elum Ranger District was burned by sheepmen to improve grazing (Carter and Holstine 1994).

The earliest documentation of domestic livestock use in the area of the Swauk allotment is in the form of Wenatchee National Forest range maps, livestock use permits and inventory records. Records indicate that between the time period of 1907 and 1916 an estimated 5,200 sheep grazed in and around the vicinity of Red Top. Early Forest Service maps show the analysis area bisected by an extension of the historic Naneum-Wilson stock driveway. Forage utilization maps dated 1913 indicate the occurrence of severe overgrazing in the vicinity of this driveway. According to range records dated 1916, an estimated 6,000 sheep traveled north via this route. Sheep use along this

driveway slowly decreased during the 1920s, though use of this route continued to be documented into the 1950s. The first comprehensive allotment management plan (AMP) for domestic livestock grazing in this area was completed in 1952 (the Red Top AMP); and allowed for 900 ewes for 78 days.

Growing concern relative to the effects of overgrazing on the Forest resulted in significant livestock reductions in the Wenatchee and other Forest drainages over the next decade (Carter and Holstine 1994). Livestock numbers continued to decrease and by 1953 other uses were becoming more prevalent (Carter and Holstine 1994, Oliver et al. 1994). Nevertheless, extensive logging during the next three decades resulted in the creation of transitory rangeland that provided sufficient forage to maintain or increase livestock numbers through the late 1980s. Since the late 1980s, however, various legislation and required application of science-based standards and guidelines for protecting and improving rangeland health has resulted in reduced livestock numbers and shorter seasons of use.

Rangeland Resources Social and Economic Consequences
The analysis area considered for social and economic effects is the area that can be described as the Okanogan-Wenatchee National Forest and the local communities within and adjacent to forest. Analysis also gives consideration to the grazing permittees associated with this area.

Effect of the No Grazing Alternative (Alternative 1) on Rangeland Resources
Implementation of the No Grazing Alternative (Alternative 1) does not meet the purpose of and need for the project. Specifically, it does not provide for an appropriate level of domestic livestock grazing as set forth in the Wenatchee National Forest Land and Resource Management Plan (1990). Consequently Alternative 1 would result in adverse economic impacts to the local permittee and result in a reduction in value to the local, regional and national livestock economy. This alternative would result in a small reduction in the local tax base; as the permittee would no longer continue to provide employment or patronize businesses in town for feed, equipment, gasoline, and supplies to the degree they are currently. In addition, there would be no fees paid to the Federal Government, subsequently reducing the total amount of money shared with local counties for roads and schools, or that goes into the U.S. treasury.

Implementation of the No Grazing Alternative (Alternative 1) would adversely affect traditional land use practices and long-standing relationships between local individuals and the landscapes from which they have derived their livelihood sense of place for decades. With respect to cumulative effects, the selection of this action in combination with other existing or foreseeable future decisions which result in no grazing or reduced grazing, would adversely impact the overall, larger-scale operation of the permittee and ultimately further reduce or eliminated completely the opportunity to maintain their existing livelihood.

Effect of the Current Management Scenario (Alternative 2) on Rangeland Resources

Although Alternative 2 provides for an appropriate level of domestic livestock grazing as set forth in the Wenatchee National Forest Land and Resource Management Plan (1990) (EA Pages III-36 – III-37); continuing to implement the current management strategy does not address the need to maintain or improve resource conditions in specific areas. Alternative 2 does not ensure that authorized grazing complies with recently adopted land and resource management plans, specifically in relation to the Wenatchee Forest Plan and the Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl and Standards and Guidelines for Management of Habitat of Late-Successional and Old-Growth Related Species within the Range of the Northern Spotted Owl (1994), as amended, or currently applicable federal environmental laws, regulation and Forest Service policies and procedures.

The selection of this alternative would not result in any adverse cumulative impacts to the range resource with respect to social and economic consequences as the opportunity (and associated benefits to the permittee) to graze domestic livestock on this allotment would continue.

Effect of Adaptive Management (Alternative 3) on Rangeland Resources

The Adaptive Management Scenario (Alternative 3) addresses the two-fold purpose and need of this proposal: 1) to provide for an appropriate level of domestic livestock grazing as set forth in the Wenatchee National Forest Land and Resource Management Plan (1990) (EA Pages III-36 - III-37) and 2) to ensure that authorized grazing complies with applicable federal environmental laws, regulation and Forest Service policies and procedures, specifically in relation to Wenatchee Forest Plan and the Northwest Forest Plan amendment standards and guidelines (refer to individual resource sections in this chapter for the analyses and findings for each of the applicable standards and guidelines). The adaptive strategy provided under this alternative recognizes the continuing need for forage production from the Forest and continues this use. This alternative provides the flexibility necessary during implementation of the grazing operation to respond to changing conditions and unexpected results over time. This is particularly important because of the scale of the area under consideration, changing environmental conditions and the associated uncertainties regarding the effects of the proposal. Monitoring and subsequent evaluation of results are required to determine if adjustments in current management are necessary and to ensure adequate progress toward identified objectives.

The adaptive approach (Alternative 3) would not result in adverse economic impacts to the local permittee or result in a reduction in value to the local, regional and national livestock economy from present as livestock grazing would continue as it is with respect to numbers and season of use. This alternative would not adversely affect the local tax base; as the permittee would continue to provide employment and patronize businesses in town for feed, equipment, gasoline, and supplies. Fees would continue to be paid to the Federal Government, subsequently contributing to the total amount of money shared with local counties for roads and schools, and that goes into the U.S. treasury. This alternative would also maintain traditional land use practices and long-standing relationships

between local individuals and the landscapes from which they have derived their livelihood and sense of place for decades.

With respect to cumulative impacts, the selection of this alternative in combination with on-going dry forest restoration projects such as Liberty II and Orion Timber Sales would result in the creation of transitory range and the production of additional forage which would be available for continued utilization by permitted domestic sheep. The powerline maintenance would also provide a slight amount of additional forage, as small trees and brush is removed annually. This alternative would not result in any adverse cumulative impacts to the range resource with respect to social and economic consequences as the opportunity (and associated benefits to the permittee) to graze domestic livestock on this allotment would continue.

Other Resources Assessed

Wildlife

Wildlife

Species and Habitats Addressed
Swauk sheep allotment encompasses the following wildlife habitat types: eastside mixed conifer and montane mixed conifer forests, subalpine parkland, eastside riparian wetlands, alpine grasslands, shrublands, and herbaceous wetlands (Johnson and O'Neil. 2001). The project area is a complex mosaic of dense and open mixed conifer forests with highly variable forest structure and history of disturbance. Elevations range from approximately 2,400 (near Liberty) to over 6,000 feet on Teanaway Ridge. The current permit authorizes domestic sheep grazing on potentially all NF acreage on the allotment (44,972 acres)--minus any areas that are specifically excluded in the annual grazing plan. Most grazing impacts, however, will occur in the vicinity of the designated grazing route (37,507 ac)--primarily located in Swauk Creek watershed and hereafter referred to as the "grazing impact area" or "affected area".

Approximately 46% of the grazing impact area (18,000 ac) is dense forest (>55% canopy cover) that provides little or no herbaceous forage for grazing animals. Another 10,600 acres (28%) is characterized as "moderate tree cover" (40-55% canopy closure) capable of producing low-to-moderate amounts of herbaceous forage. Deciduous forest (usually associated with riparian areas), shrub-lands, and natural openings (dry and wet meadows) provide persistent herbaceous forage, but comprise only 5% of the impact area. Early successional stands created by logging, and open stands on southerly slopes provide "transitional" forage--available only as long as these stands remain in an open condition.

Because the entire allotment is located within the Swauk LSR, management emphasis for the last 15 years has been on the creation and maintenance of late successional forest habitats. As a result, harvest practices that regenerate forest (and create new forage openings) no longer occur here. There have been no large-scale natural disturbances here

for many decades. In this prolonged absence of disturbance, herbaceous forage production on the allotment has declined, and will continue to decline (Singleton et al., unpubl. rep. 2008). Efforts are now underway to restore and maintain open late successional forest structure on southerly slopes in the Iron Creek area and around the town of Liberty. These efforts will slightly increase the amount and quality of herbaceous forage for all grazing animals in Swauk watershed. Opportunities to restore open forest conditions in Swauk LSR (and increase grazing opportunities), however, are limited to historically open areas on south slopes that have not yet become dense enough to support spotted owls. Dense north slopes and valley bottoms will generally be managed for closed canopy conditions that provide little or no grazing opportunities for domestic sheep or wild ungulates.

Grazing has the potential to modify species composition and structure of the grass, forb, shrub, and understory tree components of both forested and non-forested habitat types; therefore this project may directly and/or indirectly affect a wide variety of wildlife. Effects are analyzed for the following species:

Management Indicator Species (MIS): The list of MIS that are potentially affected by proposed grazing includes Rocky Mountain elk (MIS for early successional forest and "edge" conditions, along with mule deer), and ruffed grouse (MIS for riparian forest, along with beaver). It also includes northern spotted owl, which is addressed under "Proposed, Endangered, Threatened and Sensitive Species".

For this project, effects of the project on riparian habitat are analyzed for ruffed grouse rather than beaver, due to limited presence of beaver on this allotment, and widespread presence of ruffed grouse. Similarly, effects are evaluated for elk, rather than mule deer (also present on the allotment), because of the Washington Department of Wildlife's emphasis on elk in Swauk Creek watershed. Effects of the project on mule deer would be similar to elk.

The project would not affect mountain goat (MIS for cliff habitat) because there is no suitable cliff habitat for goats on this allotment. Nor would it affect marten/northern three-toed woodpecker, pileated woodpecker, and primary excavators (MIS found on the allotment, but grazing would not impact dense late successional forest habitat used by marten, large tree structure used by marten and pileated woodpecker, or snag habitat used by woodpeckers).

Proposed, Endangered, Threatened, and Sensitive Species (PETS): Potential effects are analyzed for Canada lynx (threatened), grizzly bear (threatened), gray wolf (endangered), California wolverine (R6 senstive), northern spotted owl (threatened), and sharp-tailed snake (R6 sensitive). All occur or potentially occur on the allotment, and may be directly or indirectly affected by grazing.

The project area may be used on an incidental basis by peregrine falcon (an R6 sensitive species). Most use would occur in spring and fall, when migrating

peregrine falcons potentially visit riparian areas, in search of avian prey. Domestic sheep would not be present at these times. Because proposed grazing is designed to protect the long-term health of riparian vegetation, there would be no lasting impacts on avian prey habitat or the overall availabity of avian prey in riparian areas. Therefore, proposed grazing (as planned) would not impact peregrine falcon. This species is not addressed further in this document.

Other PETS Dismissed From Consideration: There is no habitat on this allotment for Bighorn Sheep, *Cryptomastix devia* (a mollusk), and Larch Mountain salamander (all R6 sensitive species). The allotment is outside the known range of marbled murrelet (a threatened species). There is no nesting habitat for bald eagle (R6 Sensitive) here, and no strong anadramous fishery that would attract migrating (or wintering) bald eagles to the area. The project would not affect these species, and they are not addressed further in this document.

Species of Concern: Effects are analyzed for migratory landbirds (a focus of growing national, regional, and local concern).

Designated Critical Habitats: The entire allotment is in designated critical habitat for the northern spotted owl (critical habitat unit or "CHU" WA-12, USDI 20002).

Combined Analysis of Alternatives 2 and 3

Alternative 2 (Current Management Scenario) and Alternative 3 (Adaptive Management) entail the same intensity, timing, and duration of annual grazing. They differ only in incorporation of adaptive management options--site-specific "fixes" that would be implemented *if and when* problems arise, to ensure continued compliance with standards and guidelines under the Wenatchee Land and Resource Management Plan ("*LRMP*" or "*Forest Plan*"). These fixes would not alter the overall grazing strategy or its effects, therefore, Alternatives 2 and 3 are analyzed together as a single grazing alternative.

Wildlife Affected Environment and Environmental Consequences

Management Indicator Species

Elk (MIS for early successional forest and edge conditions)

Overview

Swauk sheep allotment is used by elk (and mule deer) during snow-free months. Small bands of elk may also winter at lower elevations of the allotment, in the vicinity of Swauk Creek. These elk are part of the Colockum herd – the state's fifth largest elk herd, with an estimated population size of 4000-5000 animals (Singleton et al, unpubl. rep. 2008). The allotment encompasses about 10% of the Colockum elk herd range (ocular estimate, this writer). WDFW emphasizes elk management rather than deer, in and around this allotment. The project area encompasses the eastern edge of the Teanaway

game management unit (gmu #335) and western edge of the Naneum gmu (#328). Although Colockum herd numbers are apparently declining, the Washington Department of Fish and Wildlife (hereafter referred to "*WDFW*") described the Colockum herd as being in "good condition and getting adequate nutrition from the summer and fall range" (Washington Department of Fish and Wildlife, 2006, Colockum Herd Plan, pp. 14.).

Regulatory Framework for Management of Elk Habitat
No big game winter range (EW1 allocation) occurs in the Swauk sheep allotment.

For the acres that are actually grazed (i.e., the grazing impact area), most (72%) is comprised of general forest and old growth allocations that were superseded by LSR status under the Northwest Forest Plan. Approximately 20% of the area grazed is located within scenic allocations (ST1 or ST2) or Special Interest (SI1), and 5% is located within RE2A or RE2B (dispersed recreation). None of these allocations are associated with standards and guidelines that specifically address elk, or livestock grazing in elk habitat, therefore, forestwide standards and guidelines provide the regulatory framework for management of elk habitat in this project area.

Forestwide standards and guidelines for wildlife are general in nature ("*improve forage quality and quantity for big game in summer range outside EW-1 and EW-3*"), or otherwise pertain to elk habitat parameters usually influenced by timber harvest--not grazing (size of foraging areas, proximity to cover, retention of cover in migration corridors). In this project area, the following forestwide standards and guidelines for management of riparian vegetation and for range planning and inventory in riparian areas have the greatest bearing on elk. :

- Maintain at least 90% ground cover provided by trees, shrubs, grasses, sedges, and duff within the floodplain/true riparian zone.
- Maintain deciduous vegetation in riparian zones.
- Identify lands in unsatisfactory [range] condition, and develop allotment management plans that provide for improvement.
- Identify riparian areas in unsatisfactory condition, and provide for improvement.
- Implement allowable use guides for forage utilization (Refer to Chapter I). Utilization is based on the percent (of forage) removed by weight.
- Within riparian management areas, management decisions will be made in favor of riparian-dependent resources (e.g., water quality, fish/wildlife habitat), where conflicts exist.

Current Habitat Conditions for Elk
In this project area, sheep grazing may impact summer habitat effectiveness and winter range conditions for elk, by reducing forage resources and/or altering nutritional quality of forage.

Singleton et al. (2008, draft unpubl. rep, on file at the Cle Elum Ranger Station) conducted a Bayesian Belief Network[1] ("BBN") assessment of habitat conditions for elk

across the ranges of Colockum (and Yakima) elk herds. BBN modeling is a technique that uses empirical data and expert opinion to weigh important variables in determining some outcome-- in this case, elk use of habitat at a landscape scale. BBN modeling was also used to assess the ecological vulnerability (sensitivity to grazing impacts) of meadows and riparian habitats within the Colockum elk herd range. These assessments are believed to constitute the best available science for analysis of habitat conditions for elk in this project area, and results of BBN modeling are incorporated into this analysis. References to Singleton's work are cited as "BBN pp. x".

Habitat Capability: The project area closely approximates the Swauk Creek fifth-field watershed analyzed by Singleton (BBN pp. 92, Fig. 12). Habitat capability indices were assigned to 30m pixels across the entire Colockum elk herd range, and then averaged across 5th field watersheds. Indices ranged from 1 (very low habitat capability) to 4 (very high habitat capability), across the Colockum elk herd range. Most of the acreage in Swauk watershed received "*very low*", or "*low*" elk habitat capability ratings. The mean habitat capability index for this watershed was 1.39 (± 0.45)(BBN pp. 57). The mean available forage index for the Swauk subwatershed was 1.66 (± 0.38), which is also considered *low*.

Ratings were based primarily on the availability of herbaceous forage (determined by forage productivity and livestock grazing), and to a lesser degree, on security from human disturbance (determined by availability of hiding cover, presence of open roads, and visibility from roads) (BBN, pp. 89, fig. 9).

The following considerations contributed to the low habitat capability rating for this project area:

- More than 50% of the watershed area falls within the Swauk Sheep allotment, indicating a high potential for forage competition between elk and domestic sheep (BBN pp. 86, fig. 6). In this model, however, livestock grazing was *not* highly influential in predicting overall habitat capability for elk. In a scenario with no grazing by domestic livestock, the elk habitat capability for Swauk subwatershed only rose from "very low" to "low" (BBN pp. 106, fig. 26).
- Soil productivity classes comprising Swauk subwatershed were mostly characterized as low (285-570 kg/ha) or moderate (571-912 kg/ha) (BBN pp. 85, fig. 5). Due to this model's emphasis on forage production as a major determinant of elk habitat condition, soil productivity was the single-most influential input parameter for predicting elk habitat capability (BBN pp. 17).
- Forest structure classes in this area were mostly characterized as small/medium or medium/large tree. Canopy closure classes were predominantly moderate-closed (40-70%) or closed (>70%). These values indicate likely availability of hiding cover for elk, but a limited potential to produce forage under current forest conditions (BBN pp. 84, fig. 4 and pp. 83, fig. 3, respectively). Canopy closure was the second most influential parameter for determining overall habitat capability for elk.

- There is little or no security from human disturbance for elk in this subwatershed, and high percentage of the watershed is visible from roads (BBN pp. 87, fig.7; and pp. 88, fig. 8). Lack of security habitat may further reduce the realized availability of forage for elk, and/or may increase grazing pressure from elk in foraging habitats that are unseen. Presence of open roads was a somewhat distant third (behind soil productivity and canopy closure) in the list of parameters with the most influence on predicted habitat capability for elk.

Ecological Vulnerability: BBN modeling was also used to develop an ecological vulnerability index ranging from 1 (low vulnerability to grazing impacts) to 3 (high vulnerability to grazing impacts) for all watersheds in the elk study area. This index was derived from relative abundance of riparian and meadow habitats, the proportion of these areas grazed by livestock, the intensity of elk use, and the mean elk habitat capability for the area.

The model predicted that 6 out of 32 subwatersheds in the Colockum herd range were in a high ecological vulnerability class, including Swauk Creek subwatershed. The modeling indicates a high risk that grazing may impact sensitive meadows and riparian areas. Input parameters behind the Swauk rating included a moderate level of elk use, low vulnerability rating for meadows, moderate vulnerability rating for riparian areas, and domestic livestock grazing on more than 50% of the subwatershed.

In modeling scenarios with either no livestock grazing or low levels of grazing by elk, the ecological vulnerability index for the watershed changed form high to moderate, but the level of confidence in the model outcome also dropped (BBN pp. 107, fig. 27, and pp. 108, fig. 28). These findings indicate that reduced grazing pressure by either elk or livestock may have beneficial effects on sensitive meadows and riparian areas in this allotment.

Elk Environmental Consequences

Effect of the No Grazing Alternative (Alternative 1) on Elk: Elk would benefit from removal of domestic sheep from this allotment, due to reduced competition for forage in mid-to-late summer and fall, and reduced grazing pressures overall. There would also be less displacement of elk in the grazing impact area due to presence of the sheep, dogs, and a herder. Human disturbance associated with traffic and all forms of recreation, however, would continue to cause displacement of individual elk throughout the grazing impact area.

Because the maximum allowable percent utilization by sheep is limited under the Forest Plan (See Chapter 2), the additional forage that would be available to elk if sheep were removed is not significant and unlikely to affect overall elk herd size or distribution. Individual elk, particularly cows with calves, however, would benefit from increased access to forage, and the ability to disperse more evenly across the allotment. Habitat capability for elk would improve, but only slightly, and only for a few years. Transitional

forage areas will continue to decline on this allotment (in the absence of disturbance), limiting or reducing overall habitat capability for elk.

Effects of the Current Management Scenario (Alternative 2) and Adaptive Management (Alternative 3) on Elk

Direct and Indirect Effects: Planned sheep grazing under Alternatives 2 and 3 would continue to limit habitat capability and the availability of herbaceous forage for elk--on about 69% of Swauk Creek watershed, and 8% of the Colockum elk herd range, during mid-to-late summer and early fall. Utilization standards ensure that forage removed during mid-summer would recover within a few weeks of grazing by sheep, and that forage removed late in the year would recover with the onset of next growing season. Therefore, at authorized levels, the annual effect of grazing on foraging habitat for elk would be limited in extent and duration.

Riparian areas are heavily used by elk in this watershed -- particularly cows with calves (Bracken and Musser 1993). Plans to restrict or limit bedground use in riparian reserves, to limit forage utilization by sheep in riparian (and upland) areas, and to water sheep only at approved stream locations substantially reduce potential impacts to riparian vegetation, and help maintain the long-term habitat effectiveness of riparian areas for elk.

Noise associated with dogs, sheep, and presence of a herder may displace individual elk (including some cows with calves) from the grazing impact area, for days or weeks. Affected elk are likely to return to these areas once vegetation has recovered. Short-term displacement of individual elk would be inconsequential to the larger herd.

Cumulative Effects: Recreational use of meadows and forest openings (as campsites, as locations for roads and trails (both system and user-built (i.e., "unauthorized)) has increased dramatically over the last decade. Illegal activities such as mudding and motorized hill climbing are ongoing problems in some parts of this allotment, and contribute to soil compaction and erosion, loss of native vegetation, increased spread of noxious weeds, increased sediment delivery to streams, and declining water quality. The impact on elk is two-fold: not only is less forage produced, but the associated noise disturbance may displace elk from preferred habitats into areas with less disturbance (true security habitat for elk is rare in this project area). The cumulative effect from these activities and continued grazing under Alternatives 2 and 3 would be higher levels of displacement and increased grazing pressure on a reduced number of acres. Overall habitat capability for elk would still remain low.

Effects from reduced timber harvest and prolonged absence of natural disturbance are already reflected in the low habitat capability ratings for elk discussed previously.

Bedgrounds are the most heavily impacted areas from livestock grazing, due to the concentration of animals in a small area for an extended period of time (1-3 nights). In the past (prior to 2003), utilization of forage in excess of forest plan standards, compacted soils, and denuded ground were chronic problems in some traditional bedgrounds within

this allotment (often in riparian areas), and probably reduced or curtailed use of some areas by elk. Annual routing plans now exclude or limit domestic sheep use in known problem areas (e.g., lower Iron Creek). Impacts to riparian vegetation have been substantially reduced, and vegetation is recovering. Continued elk use may be slowing the rate of recovery in some areas, but elk use is not typically prolonged and tends to be dispersed, therefore, vegetation recovery is expected to continue.

Consistency Finding: Proposed grazing under Alternatives 2 and 3 would not impact elk habitat within key big game allocation areas. It would slightly reduce the amount and quality of forage available to Colockum elk during summer and fall, but only a small percentage of the herd (individual elk) would be affected, and authorized levels of grazing ensure that vegetation would recover annually if not seasonally. Individual elk may be displaced from the grazing impact area, as sheep move across and consume forage, but they would return as vegetation recovers. Planned conservation measures ensure that 1990 standards and guidelines for protection of riparian vegetation would be met or exceeded, and that planned grazing will be consistent with the overarching Aquatic Conservation Strategy. Therefore, in regard to elk, both alternatives are consistent with 1990 Forest Plan, as amended by the Northwest Forest Plan, and thus contribute to the continued viability of elk on the Forest.

Riparian Dependent Species: Ruffed Grouse (Riparian MIS), Pacific Fisher (R6 Sensitive Species), Sharp-tailed Snake (R6 Sensitive Species)

Overview

Ruffed grouse are associated with mixed hardwood and conifer tree structure typically encountered in riparian forest. They nest on the ground near cover provided by trees, stumps, logs, shrubs, and even rocks. Large logs with overhanging cover are used for territorial drumming. Their diet includes insects, seeds, berries, nuts, tree buds, blossoms, and herbaceous plants, and occasionally small amphibians—all readily available in and around healthy streamside vegetation. Dense understory shrubs are important to their persistence in summer (providing protection for broods from predators as well as diverse foraging opportunities). Dense conifer foliage may provide protection from predators and the elements in winter (Unpublished Report, Wenatchee National Forest, 1999). Planned sheep grazing has the potential to impact ruffed grouse and other riparian-dependent species, primarily by reducing ground cover within reserves, and by affecting the quantity and quality of both cover and forage for wildlife. Overgrazing could potentially reduce long-term site capability for supporting riparian vegetation.

Fisher potentially use the area, as well, although WDFW contends that fisher have been extirpated from Washington. In the absence of survey data, presence is assumed by this writer. Fishers use a variety of forest habitats, but prey- rich riparian and late successional forests are particularly important. This project would also affect fisher primarily from the effects of grazing on vegetation and prey (including ruffed grouse) in riparian reserves.

In this allotment, mesic and moist riparian forest on or adjacent to open, rocky, south-facing slopes provides potential habitat for sharp-tailed snake. No sharp-tailed snakes have been detected in the project area. Down wood, fractured rock, and loosely compacted rock and/or talus may be important for maintaining the species, and activities that impact soil moisture regimes or reduce cover features would be detrimental to sharp-tailed snakes. Sheep-gazing has a potential to impact sharp-tailed snakes by trampling buried eggs or snakes themselves, and by reducing the detritus and vegetation used by snakes and their preferred prey--slugs (Washington Department of Natural Resouces, on-line information for Sharptail Snake, 2006).

Regulatory Framework
Under the Northwest Forest Plan (1994), consistency with the Aquatic Conservation Strategy (ACS) is the mechanism for ensuring viability of riparian dependent species. Riparian Reserves are managed to protect the health of aquatic ecosystems and to provide habitat for all riparian-dependent species (aquatic and terrestrial) (ROD, pp. 6-7).

Standards and guidelines for Riparian Reserves address retention of shade, ground cover, and down wood along streams. Planned sheep grazing will primarily affect wildlife through removal of ground cover in riparian reserves. All forest-wide standards and guidelines listed previously in discussion of "elk" also pertain to ruffed grouse, and most other riparian-dependent wildlife.

There are no conservation plans for fisher or sharp-tailed snake in the state of Washington. Under Forest Service Manual 2670 direction, management actions on National Forest must not contribute to a downward trend towards listing of any R6 sensitive wildlife species, including fisher and sharp-tailed snake

Riparian Dependent Species Affected Environment
Approximately 37% of the Swauk sheep allotment (17,600ac) is within riparian reserves associated with class 1, 2, or 3 streams[2]. There are 12,780 ac of riparian reserve in the grazing impact area, and about half of this acreage (6311 ac) is in vegetation types likely to be grazed by sheep. The affected area is about 13% of all riparian reserve acreage in Swauk Creek watershed.

Conditions in the affected Riparian Reserves are highly variable, and reflect many influences: proximity to open roads (both Forest roads and S.R. 97), recreational use, past timber harvest, past and present mining activity, past and present grazing and range improvement practices, small-scale natural disturbances, et. Stream surveys in the affected area have focused primarily on streamside vegetation that provides shade and contributes to down wood recruitment in streams. There is little or no information, however, about vegetative conditions across broader riparian reserves.

[2] Acreage is based on default riparian reserve buffers for mapped streams, as of fall, 2007.

Recent monitoring of grazing practices and range condition along the preferred grazing route indicate that most of the affected riparian habitat currently meets or exceeds the standard for retention of 90% ground cover within riparian reserve, or else sheep would routinely be routed away from these areas. Known problem areas have been excluded from grazing and/or use as a bedground for several years, and will not be used until vegetation has recovered.

Sharp-tailed snakes are active above ground, only when surface conditions are moist, and retreat underground when conditions are dry. Breeding is believed to take place in April or May, eggs are laid underground in June or July, and hatch in fall (Washington Department of Natural Resource, on-line information for Sharptail Snake, 2006). Most of the time that sheep are present on this allotment, sharptailed snakes would be underground, however, some overlap may occur in early summer and fall when snakes are active. Snakes would presumably seek escape cover when sheep are near, therefore, impacts would stem mostly from effects on vegetation (detritus for slugs) rather than the snakes themselves.

Riparian Dependent Species Environmental Consequences

Effect of the No Grazing Alternative (Alternative 1) on Riparian Dependent Species
Riparian dependent wildlife such as ruffed grouse, fisher, and sharp-tailed snake would benefit slightly from curtailment of sheep-grazing, due to increased amount and quality of herbaceous and forage and cover in riparian reserves, particular in late summer and fall, and also to reduced potential for trampling of small sharp-tailed snakes.

Effect of the Current Management Scenario (Alternative 2) and Adaptive Management (Alternative 3) on Riparian Dependent Species

Direct and Indirect Effects
Grouse, fisher, and other riparian-dependent wildlife may be displaced for short periods of time (i.e., hours, days or weeks) from riparian habitat in the grazing impact area, due to noise disturbance associated with presence of 2000 sheep, dogs, and a herder, and also due to reduction--but not elimination--of forage and cover in the riparian reserves. Physical impacts from grazing would occur progressively across the allotment--not all at once--but once an area is grazed, effects on vegetation would persist for days or weeks, or at worst, until the next growing season. The duration of disturbance in any one locality would be from a few hours up to 3 days.

Only a portion of affected riparian acres are likely to provide habitat for sharp-tailed snake. They apparently utilize only those stream-side areas that are near well-exposed south-facing slopes--probably less than ¼ of the potentially affected riparian habitat on this allotment. The affected acreage is small, and planned limits on placement of bedgrounds, stream crossings, and watering areas would help protect this stream-side habitat. Implementation of utilization standards would limit effects on riparian vegetation, therefore, grazed areas should retain detritus capable of supporting both sharp-tailed snakes and their prey.

Planned grazing has or would relocate sheep grazing routes and bedgrounds from Riparian Reserves where previous grazing practices resulted in degradation of riparian habitat. It would exclude grazing from wet meadows-both upland and stream adjacent, and would limit the intensity and duration of grazing in all riparian areas. It would also entail monitoring forage utilization, range condition, and effectiveness of restoration efforts at specific locations along the grazing route, and would implement an adaptive management strategy to correct any problems detected. Based on these provisions, and the limited percentage of riparian habitat in Swauk watershed that would be affected (13%), proposed reauthorization of grazing may impact but is not likely to adversely impact all riparian dependent wildlife, including ruffed grouse, fisher, and sharp-tailed snake.

Cumulative Effects

Recreational use of riparian areas has increased dramatically over the last decade, and in places, has created areas devoid of vegetation, snags, and down wood. These areas typically occur near roads. Unauthorized OHV use also contributes to degradation of riparian areas, in the form of increased soil compaction and erosion, loss of native vegetation, increased spread of noxious weeds, increased sediment delivery to streams, and declining water quality. All of these activities have reduced habitat effectiveness for species such as fisher and ruffed grouse, in the Swauk sheep allotment.

Heavily used dispersed camping areas near creeks would not be grazed, but in combination with grazing, increase the percentage riparian habitat in Swauk watershed that is in a degraded condition, and also increase the amount of habitat where both species are at risk of displacement from preferred riparian habitats.

Efforts to restore these overused areas are underway, and grazing instructions have been modified to avoid active restoration area until vegetation has recovered.

Consistency Finding

Planned grazing under Alternatives 2 and 3 is designed to meet forest plan standards and guidelines for retention of ground cover in riparian reserves, and to implement utilization standards known to ensure recovery of riparian vegetation. Known problem areas would not be grazed until riparian vegetation has recovered, and if new problem areas are discovered through monitoring, they too would be excluded from grazing. These provisions ensure that impacts from grazing under Alternatives 2 and 3 are would be consistent with Forest Plan provisions for protection of riparian reserves, and will therefore contribute to continued viability of all riparian dependent species.

On this basis, planned grazing under Alternatives 2 and 3 would not result in a downward trend towards federal listing of Pacific fisher or sharp-tailed snake.

Other Threatened, Endangered, and Sensitive Wildlife

Gray wolf (Threatened) and California Wolverine (R6 Sensitive)

Overview and Regulatory Framework
Unconfirmed wolf sightings have occurred in the Swauk sheep alotment, in the last 20 years. There are no known wolf den sites or rendezvous sites on the Cle Elum Ranger District.

There have been no sightings of wolverine on or near this allotment. There is no denning habitat for wolverine on or near this allotment.

There is no recovery plan for wolves in the state of Washington, however, recent interagency guidelines address appropriate responses to wolf sightings, injury, and depradation of livestock. This guidance has been incorporated into alternatives 2 and 3 (See appendix A of this assessment).

There is no conservation plan for wolverine in the state of Washington. Under Forest Service Manual 2670 direction, management actions on National Forest must not contribute to a downward trend towards listing of R6 sensitive wildlife species.

Gray Wolf and California Wolverine Affected Environment

Gray wolf and wolvines may be attracted to the project area by the availability of preferred prey (deer and elk), particuarly in spring and early summer when calves and fawns are present (Bianci 1994). High density of roads, however, probably limits habitat effectiveness for both of these predators and their ungulate prey on most of this allotment. Gaines et. al (2003) reported that 77% of the Swauk BMU had open road densities in excess of 2 mi/sq mi--indicating a high level of human influence on gray wolf (and wolverine) habitat, in and around Swauk Creek watershed. Open road and motorized trail densities for subwatersheds comprising the allotment range from 2.2 mi/sq mi (Iron Creek) to 6.3 mi/sq mi (Cougar Gulch) (Swauk Watershed Analysis pp. 4-65, 1997). At this level of human disturbance, any wolf use of the project area is likely to be incidental.

Gray Wolf and California Wolverine Environmental Consequences

Effect of the No Grazing Alternative (Alternative 1) on Gray Wolf and California Woverine

Gray wolves and wolverine would benefit slightly from removal of sheep grazing on this allotment, due to slightly improved foraging conditions for deer and elk, slightly improved retention of understory vegetation in riparian areas (cover for small mammal prey) and reduced likely of displacement of both predators and their prey due to disturbance associated with presence of large numbers of sheep, herd dogs, and a herder.

Effect of the Current Management Scenario (Alternative 2) and Adaptive Management (Alternative 3) on Gray Wolf and California Woverine

Direct and Indirect Effects: Grazing by domestic sheep will remove forage that could be used by deer and elk, and is also likely to result in displacement of deer and elk from areas occupied by sheep. Both effects would be temporary, due to planned limits on the amount of forage utilization allocated to sheep, and to the highly mobile grazing strategy that will be implemented. Although this project will not result in loss of security habitat for wolves and wolverine within the Swauk BMU, the presence of a herder and herd dogs may still pose a direct disturbance to foraging predators, causing displacement or avoidance of grazed areas.

Because the permittee will be required to dispose of domestic sheep carcasses, the likelihood of of predators becoming habituated to feeding on or around sheep, is reduced

There would be no animal damage control permitted under the grazing permit. If depredation by gray wolves (or wolverine) were to occur, the permittee would notify the range adminstrator as soon as possible. Predator identification information would be provided to the permittee to help distinguish gray wolves from coyotes.

Cumulative Effects: The effects of past and present management actions that affect elk and elk habitat were discussed previously, under elk. We know of no future actions that in combination with proposed grazing, would result in cumulative effects to gray wolves, wolverine, or their ungulate prey.

Determination of Effect: Proposed grazing will reduce forage availability for deer and elk, and may dispace deer and elk from areas occupied sheep, slightly reducing predaceous foraging opportunties for wolves and wolverine, and/or directly displacing them through disturbance. Due to current high levels of human disturbance, however, grazing is unlikely to pose a disturbance to wolves at rendezvous or denning site. The loss of foraging opportunity would be temporary, and inconsequential to a wide-ranging carnivore like wolf. Grazing, as proposed under alternatives 2 and 3 may affect but will not likely adversely affect gray wolf, and may impact but will not likely adversely impact California wolverine. It would not result in a downward trends towards federal listing of California wolverine.

Grizzly Bear (*Ursos horribilis*)

Overview and Regulatory Framework
The entire allotment is located within the North Cascades Grizzly Bear Recovery Zone (Swauk Bear Management Unit, or "BMU"). Management of grizzly bears must be consistent with North Cascades Chapter of the Grizzly Bear Recovery Plan (U.S.D.I 1997). Implementation of sanitation measures that reduce the potential for adverse encounters between grizzly bears and people is critical to recovery efforts in the Recovery Zone. These measures also include provisions for removal of livestock on grazing allotments, so that bears (who often feed on carrion) don't become acclimated to feeding on livestock.

There have been unconfirmed grizzly bear sightings on the allotment, including 2 sightings in 2008.

Grizzly Bear Affected Environment

Grizzly bears may be attracted to the project area by the availability of both herbaceous forage and prey (deer, elk, small mammals), particularly in early spring when low elevation areas support new spring vegetation, and in spring and early summer when calves and fawns are present on the allotment. There is no anadramous fishery that would attract bears to the project area, and there is no denning habitat for grizzly bears on or near this allotment.

High density of roads and motorized trails currently limits habitat effectiveness for bears on the Swauk Creek sheep allotment. Gaines et. al (2003) reported that only 63% of the Swauk BMU provided early season core area for grizzly bears--indicating a high level of human influence on bear habitat in this BMU. Most of this core area acreage is in unroaded parts of Teanaway watershed, well outside the allotment. Due to a high level of human disturbance, any grizzly bear use of the project area is likely to be incidental.

Grizzly Bear Environmental Consequences

Effect of the No Grazing Alternative (Alternative 1) on Grizzly Bear

Grizzly bears would benefit slightly from removal of sheep grazing on this allotment, due to slightly improved foraging conditions for grizzly bears, and their ungulate prey (deer and elk), in summer. There would also be reduced likelihood of bears being displaced from the grazing impact area, due to disturbance associated with presence of sheep, herd dogs, and a herder.

Effect of the Current Management Scenario (Alternative 2) and Adpative Management (Alternative 3) on Grizzly Bear

Direct and Indirect Effects: Proposed grazing has a potential to indirectly affect grizzly bears by removing herbaceous forage that could be used in summer by both grizzly bears and their ungulate prey. It may also affect bears by displacing deer and elk from areas occupied by sheep, during calving and fawning periods (reducing an important predaceous foraging opportunity for bears). Proposed grazing will not affect the availability of early spring forage for bears, however, because sheep will not be turned out on the allotment before 10 June.

Although this project will not result in a net loss of core area within the Swauk BMU, the presence of a herder and herd dogs may still pose a direct disturbance to foraging bears, causing displacement or avoidance. The effect would be temporary (days to a few weeks--the length of time needed for vegetation to recover and once again support use by bear, deer, and elk).

Sanitation measures for grizzly bear would be included under both Alternatives 2 and 3 (Refer to Chapter 2). The permittee would be required to dispose of domestic sheep carcasses in a manner that will not attract bears, therefore the likelihood of grizzly bears becoming habituated to feeding on or around sheep, is reduced. Planned sanitation measures for storage and disposal of food and other bear attractants reduce the likelihood of adverse encounters between grizzly bears and people within the Recovery Zone.

No animal damage control would be permitted under the grazing permit. If depredation by grizzly bears (or black bears) were to occur, the permittee would notify the Range Administrator immediately. Predator identification information wouldl be provided to the permittee to help them distinguish between black bears and grizzly bears.

Cumulative Effects: Past and present management actions that have affected ungulate prey, and the effects of the existing road and trail network were discussed previously. We know of no future actions that in combination with proposed grazing, would result in an additional cumulative effect to grizzly bears.

Determination of Effect: The project will not result in a net loss of core area within the Swauk BMU, and is consistent with interim guidance for management of grizzly bears in the North Cascades Grizzly Bear Recovery Zone. Proposed grazing will slightly reduce available forage for both grizzly bears and their ungulate prey, and disturbance from grazing may also displace both grizzly bears and their prey from areas occupied by sheep, dogs, and a herder. The loss of foraging opportunity (both herbaceous and predaceous) would be small and inconsequential to grizzly bears, which probably use this area only on an incidental basis. Proposed grazing may affect but will not likely adversely affect grizzly bear.

Northern Spotted Owl (Threatened)

Overview and Regulatory Framework
Approximate 49% of the Swauk Sheep allotment (23,730 out of 47,900 ac) is dense closed canopy forest that provides nesting, roosting, and foraging habitat for spotted owls. Management of spotted owl habitat is based on its status as Lat Successional Reserve (LSR) under the Northwest Forest Plan, and guidance from the Swauk LSR Plan.

All of the grazing impact area is within a spotted owl demography study area, and is surveyed annually for spotted owls. All known owls are banded, and monitored annually by PNW research personnel. There are 18 known activity centers in or near the allotment, including 10 occupied and 8 historic sites.

Northern Spotted Owl Environmental Consequences

Effect of the No Grazing Alternative (Alternative 1) on Northern Spotted Owl
In the absence of sheep grazing, all understory vegetation in dispersal habitat for spotted owls would remain available as cover for prey, maintaining incidental foraging

opportunities for dispersing owls. The absence of disturbance may also facilitate germination and persistance of tree seedlings that could--in the continued absence of disturbance-- increase tree density and canopy cover over time. These changes, however, may not be sustainable for owls.

Effect of the Current Management Scenario (Alternative 2) and the Adaptive Management Alternative (Alterntive 3) on Northern Spotted Owl

Direct and Indirect Effects: Due to a limited forage base in this allotment, sheep are likely to graze in moderate canopy forest areas that provide dispersal habitat for spotted owls. Removal of herbaceous forage by domestic livestock, deer, and elk will temporarily reduce protective cover and herbaceus forage for certain small mammals (pocket gopher, pika, mice and voles) that comprise a portion of the spotted owl diet. It would have less effect on flying squirrels--the primary prey of spotted owls in this province, and bushy-tailed woodrat (a secondary prey item). This removal of herbaceous cover for prey would slightly reduce predaceous foraging opportunities for dispersing spotted owls, but is unlikely to affect survival and reproduction of resident owl pairs. By removing herbaceous cover for potential prey, however, proposed grazing would degrade approximately 10,630 of dispersal habitat in the Swauk and Teanaway watershed areas.

Effects from Disturbance: Grazing activity will not occur in occupied owl habitat due to lack of herbaceous forage. The concentrated presence of herders, dogs, and sheep at bedding grounds, however, could potential disturb any nearby owls for 1 to 2 nights. No bedding grounds are located within core nesting areas, therefore, the likelihood of disturbance to nesting pairs is reduced. The risk of adverse effect from disturbance is insignificant.

Cumulative Effects: Prolonged lack of natural disturbance (cessation of wildfires) is allowing young trees to become established in some moderately open forest areas that provide dispersal habitat for spotted owls, and this higher density of trees is reducing the amount and quality of herbaceous forage available to grazing animals, at the same time that it enhances foraging opportunities for dispersing spotted owls. Past and proposed grazing (a different form of disturbance) has helped limit tree regeneration in some open stands, and countered some of the potential effects from prolonged absence of fire.

Two other ongoing vegetation management projects will also restore and maintain open understory conditions, removing and degrading dispersal habitat for spotted owls on parts of this allotment. These projects, in combination with proposed grazing, result in a cumulative effect on dispersing spotted owls. Tree removal, underburning, and associated road actions under the Iron Thin Project will remove 1437 ac and degrade 451 ac of dispersal habitat. Similar activities under the Liberty Fuels II project will result in a net loss of 104 ac, and degradation of 600 ac of dispersal habitat. The dispersal habitat affected by these projects is included in the 10,630 ac of dispersal habitat that will be degraded by this project, therefore the cumulative acreage will not change—only the intensity of effect on areas subject to both thinning and grazing. Some thinned and grazed stands (1051 ac total) will continue to function as dispersal habitat for spotted

owls, degraded by removal of both herbaceous and woody understory vegetation (cover for prey). Another 1542 ac of dispersal habitat will eventually be rendered unsuitable for owl use (due to heavy thinning and reduction of ground cover), and unsuitable conditions may be prolonged by grazing. The cumulative effect will be additional--and in places--prolonged loss of predaceous foraging opportunity for dispersing owls. There would be no cumulative effects, however, on resident owl pairs,

Consistency with the Northern Spotted Owl Recovery Plan of 2008: On 16 May 2008, the U.S. Fish and Wildlife Service ("FWS") released a final Recovery Plan for the northern spotted owl. The plan established a network of habitat reserves (managed owl conservation areas or "MOCAs") in the western provinces comprising the range of the northern spotted owl, and a broader, landscape based habitat approach (*without defined MOCAs*) in the dry forest eastern provinces. The Plan is currently under review.

Under the 2008 Recovery Plan, Swauk Sheep Allotment is located in the dry eastern Washington Cascades province, where owls and owl habitat are at risk to uncharacteristically large and severe wildfires. The recovery strategy for fire prone east-side forests is to 1) identify and maintain well-distributed, spatially dynamic patches of high quality spotted owl habitat; 2) manage lands outside of these patches to maintain and restore ecological processes and 3) reduce the potential for uncharacteristically large stand-replacing disturbance from wildfires, insects, and disease (USDI 2008).

The Okanogan - Wenatchee NF has developed an interim process for determining consistency with the Recovery Plan, in dry east-side forests (Gaines, unpubl. draft, 2008). Consistency is determined by a project's effects on dry forest structure as it relates to high severity fire, and its effects on desired large tree structure. Consistency is also based on maintaining certain percentages of capable spotted owl habitat in a high quality condition for owls. None of the alternatives considered for this project (including no action) will affect the area's potential for high severity fire, or the recruitment of desired large tree structure. Nor will they affect the percentage of capable owl habitat maintained in high quality condition for spotted owls. Therefore, all alternatives are consistent with the Final Spotted Owl Recovery Plan.

Determination of Effect: Proposed grazing will not affect nesting, roosting, foraging (NRF) habitat for spotted owls. It may, however, reduce herbaceous cover and forage for ground-dwelling prey species in dispersal habitat, slightly reducing predaceous foraging opportunities for dispersing spotted owls. Proposed grazing would degrade approximately 10, 630 of dispersal habitat in the Swauk and Teanaway watershed areas. Effects on dispersing owls would be temporary, localized, and inconsequential because NRF habitat (and the availability of preferred prey in NRF habitat) would not be affected. Therefore, proposed grazing may affect but will not likely adversely affect spotted owls.

Critical Habitat for the Northern Spotted Owl

Overview and Regulatory Framework
Approximately 91% of the National Forest lands comprising this allotment is designated critical habitat for the northern spotted owl (Critical habitat unit (CHU) WA-12, USDI 1992). All of this acreage, (as well as the remaining non-chu acreage comprising the allotment) is part of Swauk LSR. This LSR is one of 3 "source" LSRs on the Forest, sized to support a at least 20 nesting pairs of spotted owls over time--a self-sustaining population capable of producing surplus owls that can emigrate into smaller reserves. Swauk LSR is managed according to the Swauk LSR Plan, which has undergone external review and been found consistent with the Northwest Forest Plan. Critical habitat evaluation is based on guidance from the U.S. Fish and Wildlife Service, and consistency with the Swauk LSR Plan.

Critical Habitat for the Northern Spotted Owl Affected Environment
Owl populations have been in decline in Swauk LSR (and CHU WA-12), since its establishment in 1994,. Grazing would potentially impact 10,630 ac of dispersal habitat in CHU WA-12 (approximately 25% of the existing disersal habitat), but is not likely to affect NRF habitat for spotted owls., or the number of resident owl pairs.

Critical Habitat for the Northern Spotted Owl Environmental Consequences

Effect of the No Grazing Alternative (Alternative 1) on Critical Habitat for the Northern Spotted Owl
In the absence of sheep grazing, all understory vegetation would remain available as cover for prey in dispersal habitat for spotted owls, maintaining foraging opportunities for owls. The absence of disturbance may also facilitate germination and persistance of tree seedlings that could--in the continued absence of disturbance-- increase tree density and canopy cover over time.

Effect of the Current Management Scenario (Alternative 2) and Adaptive Management (Alternative 3) on Critical Habitat for the Northern Spotted Owl

Direct and Indirect Effects: Sheep will primarily graze in nonforest habitat and forest habitat that is unsuitable for spotted owl use (areas with < 40% canopy closure, and/or pure stands of ponderosa pine or lodgepole pine). Because the meadows and grasslands that provide persistent forage for herbivores currently comprise a small proportion of this allotment, and because unsuitable forest habitat is declining due to a variety of factors (recent cessation of timber harvest activities, prolonged lack of natural disturbance in historically open areas, and management emphasis on maintaining dense late successional forest for spotted owls), domestic sheep are expected to graze here in moderate canopy stands that provide dispersal habitat for owls (one of the constituent elements of critical habitat for owls). By temporarily reducing forage and cover for certain small mammal prey in moderate canopy stands (pocket gopher, pika, mice and voles), grazing will slightly reduce foraging opportunities for dispersing owls, and will degrade (but not remove) dispersal habitat. Its effects on habitat will be temporary, and as planned, will not affect overall site capability for supporting dispersal habitat structure

for owls. Grazing will not affect NRF habitat for owls (another constituent element of CHU).

Cumulative Effects: Two other ongoing vegetation management projects will also remove and degrade dispersal habitat for spotted owls in CHU WA-12, and in combination with proposed grazing, would result in a cumulative effect. Tree removal, underburning, and associated road actions under the Iron Thin Project will remove 1437 ac and degrade 451 ac of dispersal habitat in CHU WA-12. Similar activities under the Liberty Fuels II project will result in a net loss of 104 ac, and degradation of 600 ac of dispersal habitat in CHU WA-12. The affected acreages (1542 ac removed, 1051 degraded), however, are already included in the 10,630 ac of dispersal habitat that will be degraded by this project, therefore the cumulative acreage will not change—only the intensity of effects on dispersal habitat subject to both thinning and grazing. These stands will continue to function as dispersal habitat, with even greater reduction in foraging opportunities for dispersing owls, than stands with either thinning or grazing alone.

Determination of Effect: Based on expected annual degradation of up to 10,630 ac of dispersal habitat in CHU WA-12 (due to reduction of cover and forage for mammalian prey resulting from grazing), the proposed project *may affect but will not likely adversely affect critical habitat for the northern spotted owl.* Effects will be localized along the selected grazing route for any given year, and will by design, be temporary. Proposed grazing will not alter this CHU's contribution to overall spotted owl recovery efforts, and is consistent with the Swauk LSR Plan.

Canada lynx (*Lynx canadensis*)

Overview and Regulatory Framework
The Swauk Sheep Allotment overlaps portions of two lynx analysis units (LAUs), and also encompasses suitable habitat for lyx within these allotments (Table III-7, below). There are no recent confirmed lynx sightings on the allotment, but several unconfirmed sightings have occurred in the last 10 years.

Lynx habitat on the Cle Elum Ranger District is characterized under the (amended) Lynx Agreement (2006) as unoccupied and peripheral to recovery needs of Canada lynx. It is a potential refugium, however, for any lynx that may be displaced by large fires in occupied habitat to the north. Therefore, grazing has a potential to impact lynx, and is still evaluated in the context of the Lynx Conservation Assessment and Strategy.

Table III-7: Lynx Analysis Units (LAU) Comprising the Swauk Sheep Allotment

LAU	LAU acres in Allotment	Suitable Lynx Habitat within Allotment	
		Acres	% of allotment acreage within LAU

Table III-7: Lynx Analysis Units (LAU) Comprising the Swauk Sheep Allotment			
Table Mountain	16,400	6200	38
Teanaway	19,900	12,000	60

Canada Lynx Affected Environment
Most of the available lynx habitat in the allotment (and in both affected LAUs) is either dense late successional forest that provides denning opportunities for lynx, or forest that has grown into a stem exclusion phase (an unsuitable habitat condition for lynx). There are very few 20-30-year old conifer stands that provide optimum foraging conditions for lynx and/or their preferred prey (snowshoe hares). Lynx are also also known to forage in riparian habitats occupied by snowshoe hare, therefore, proposed grazing in higher elevation riparian forest has a potential to impact lynx.

High density of roads and motorized trails probably limits riparian habitat effectiveness for most wildlife (including lynx) in this project area. Gaines et. al (2003) reported that 88% of the riparian habitat in the watershed had road and motorized trail densities greater than 2 mi per sq mi, indicating a high level of human influence on riparian habitat effectiveness for wildlife (Table 26, pp. 47). Therefore, lynx use of riparian habitats here is likely to be incidental.

Canada Lynx Environmental Consequences

Effect of the No Grazing Alternative (Alternative 1) on Canada Lynx
In the absence of sheep-grazing, all herbaceous and shrub cover in high elevation riparian forest areas will remain available as cover for hares and other potential small mammal prey for Canada lynx. These areas would continue to provide predaceous foraging opportunities for lynx. There would be no displacement of lynx due to disturbance from presence of sheep, herd dogs, or a herder.

Cumulative Effects: Lynx would benefit slightly from curtailment of sheep-grazing on this allotment, due to improved foraging conditions in high elevation riparian reserves, and to increased cover for prey within the riparian reserve. Displacement of lynx from preferred foraging habitats would continue, but only in association with ongoing traffic and recreational activities.

Effect of the Current Management Scenario (Alternative 2) and Adaptive Management (Alternative 3) on Canada Lynx

Direct and Indirect Effects: In the Lynx Conservation Assessment and Strategy (LCAS), Ruediger et al. (2000) reported that in summer, snowshoe hares eat forbs, grasses, leaves of shrubs, and some woody browse--all readily available here in high elevation riparian and aspen forests. The LCAS cites past grazing as a factor in the decline of aspen as a

seral species in subalpine forests. Young, densely regenerating aspen stands with a well-developed understory provide good quality habitat for snowshoe hares and other potential lynx prey species, such as grouse. Ruediger et al. (2000) recommended that grazing be managed so so that it does not inhibit regeneration of aspen clones.

All of these studies indicate that high elevation grazing has a potential to indirectly affect lynx in summer by removing herbaceous forage and cover that may be used by snowshoe hares (primary prey), as well as ruffed grouse, Douglas squirrel and chipmunks (secondary prey). Intense grazing may also alter vegetation (and habitat structure for prey) in important microhabitats for lynx--riparian meadows and stands of aspen and alder.

In Alternatives 2 and 3, most grazing will occur in non-forest vegetation types and forested types with less than 40 percent canopy cover--these tend to be dry forest areas that do not provide habitat for lynx). Planned conservation measures would limit the duration and intensity of grazing in riparian areas, as will as timber harvest and recently burned areas, where young trees are not yet fully established.

Effects from Disturbance: Proposed grazing and presence of a sheepherder with dogs may displace individual lynx from important summer foraging areas--high elevation riparian meadows and willow, alder, and aspen stands. This effect would be temporary and insignificant, because sheep would not be allowed to linger or concentrate in these habitat, and only individual lynx in the vicinity of sheep herds would be displaced. Also, relatively few bedding grounds are located in lynx habitat, reducing the potential for disturbance to lynx.

Determination of Effect: Proposed grazing will slightly reduce available forage and cover for lynx prey on a fraction of the area that is grazed, and disturbance from grazing may also displace both lynx and their prey from areas occupied by sheep, dogs, and a herder. The loss of foraging opportunity (both herbaceous and predaceous) would be small and inconsequential to lynx, because the affected area is only a fraction of the total lands grazed and the affected LAUS, and is probably used only on an incidental basis by lynx. The effects on vegetation would also be both localized and temporary. Plans to exclude grazing from recently burned forest, ensure that future foraging opportunities for lynx will be allowed to develop, in the event of a fire. Proposed grazing may affect but will not likely adversely affect Canada lynx.

Migratory Landbirds (spp of growing local, regional, and national concern)

Overview and Regulatory Framework
In 2001, executive order 13186 of the president of the United States directed all federal agencies to consider the conservation needs of bird "species of concern" in the design, analysis, and implementation of activities on lands that they administer. These species of concern include birds that are listed as threatened or endangered under the federal

Endangered Species Act, and other "Birds of Conservation Concern" identified by the U.S. Fish and Wildlife Service.

Various federal and state agencies and concerned organizations have come together under the "Partners in Flight" (*PIF*) banner to develop Bird Conservation Plans for different parts of the Unites States. These plans are not regulatory, but provide a framework and strategy that implemented across all ownerships would improve the effectiveness of all landbird conservation efforts. They identify design criteria for project-level activities, and focus attention on habitat features that are most important for conservation of resident landbirds. For this project, the *Conservation Strategy for Landbirds on the East Slope of the Cascade Mountains in Oregon and Washington* (Altmon 2000) and *A Conservation Strategy for Landbirds in the Columbia Plateau of Eastern Washington and Oregon* (Altman and Homes 2000) are the basis for analysis of effects to migratory landbirds. These plans identify riparian forest as a high priority habitat for landbird conservation.

Livestock grazing potentially influences bird communities through noise disturbance or trampling of nests with eggs or young by sheep, herders, and dogs, or indirectly through alteration of vegetative structure that provides nesting, resting, hiding, or foraging cover for landbirds and their prey (insects, small mammals, or other birds). Either may result in abandonment of nests, or displacement from preferred foraging, nesting, and resting habitats.

Forbes (1994 unpubl. rep.) citing Anderson (1993) reported that annual grazing was associated with decreased bird abundance, as well as decreased shrub volume and shrub heights. Citing Bock (1992), he also reported that the migratory landbirds most affected by grazing were species associated with open forest cover and those that nest in heavy shrub or herbaceous cover, and feed on nectar, insects, or seeds in the understory or on the ground. In this project area, these conditions are associated primarily with riparian reserve acreage. Grazing within riparian reserve has the most potential to influence migratory landbirds.

Migratory Landbirds Environmental Consequences

Effect of the No Grazing Alternative (Alternative 1) on Migratory Landbirds
In the absence of sheep-grazing, disturbance to ground- and shrub-nesting birds in riparian forest would be greatly reduced, and almost all of the available herbaceous ground- and shrub-vegetation would remain available as cover to landbirds and their associated prey. Some grazing by elk would continue, but elk use would be more dispersed, and less prolonged than sheep, therefore, effects on landbirds would be reduced.

Effect of the Current Management Scenario (Alternative 2) and the Adaptive Management Alternative (alternative 3) on Migratory Landbirds

Direct and Indirect Effects

Proposed grazing in June may result in nest abandonment, and potentially direct mortality of some ground-nesting landbirds (such as chipping sparrow or dark-eyed junco), due to trampling of nestlings or eggs by sheep. These species often nest in or near riparian areas in the grazing impact area. By July, most ground-nesting birds would have fledged, and could move away from approaching sheep. The effect on landbird populations would be insignificant.

Removal of some riparian shrub cover may also disrupt or preclude nesting by such species yellowthroat, calliope and rufus hummingbirds, and Macgillivray's warbler. Planned conservation measures that limit the intensity and duration of grazing in riparian areas would reduce the risk of mortality to ground-nesting birds, and also impacts to vegetation that provide nesting and foraging cover, as well as protection from predators.

Cumulative Effects: Recreational use of riparian areas has increased dramatically over the last decade, and in places, has created areas devoid of vegetation, snags, and down wood--along with nesting opportunities for landbirds. These areas typically occur near roads. Unauthorized OHV use also contributes to degradation of riparian areas and cumulative loss of nesting habitat for landbirds.

These heavily used dispersed camping areas near creeks would not be grazed, but in combination with planned grazing, increase the percentage of degraded riparian habitat in Swauk watershed, and the total amount of riparian habitat that that has been rendered unsuitable for use by nesting landbirds. Recovery efforts are underway in some areas therefore, the amount of degraded habitat may decline over time.

Consistency Finding: Based on plans to limit the intensity and duration of grazing in Riparian Reserves, effects of riparian vegetation will be temporary. The affected riparian acreage would also be a small percentage of the available riparian habitat in this watershed (see previous discussion under "ruffed grouse"). Therefore, proposed grazing is consistent with conservation of migratory landbirds.

Heritage Resources

Heritage Resources Affected Environment

Section 106 of the National Historic Preservation Act requires that Federal Agencies take into account the effects of activities and programs under their direct or indirect jurisdiction (including those requiring Federal permit, license or approval) on Historic Properties. Historic properties are objects, features, sites or buildings that meet National Register of Historic Places eligibility criteria. Generally speaking, to be eligible for or listed on the National Register, the building, feature, site or artifact is generally fifty or more years old and is significantly associated with important historical events, important people, embodies distinctive characteristics of a type, period or method of construction (or represents the work of a master) or can yield information important in history or prehistory; and maintains sufficient physical integrity of location, design, setting, workmanship, materials, feeling and association to convey its significance. Properties

that have not been formally evaluated against National Register criteria are considered "potentially eligible" for listing, and are managed as though they were eligible. For the purposes of this undertaking, the grazing allotment management boundary [project area] was considered the area of potential effect with respect to historic properties.

Numerous pedestrian archaeological surveys have been conducted in the project area since the late 1970s for a variety of undertakings, including timber sales and fuel treatment projects, mining projects and watershed restoration efforts. A large proportion of the Swauk Sheep Allotment was subject to intensive sample surveys in the recent past (Iron Timber Sale-CRR R2002-061703-004 and Liberty Fuels Stewardship-CRR 061703/2005-07).

At least 169 properties have been identified within the project planning area. Prehistoric to ethnographic use of the area is indicated by discoveries of stone tool debitage and artifacts, peeled trees, and rock shelters. Historic themes of mining, trapping, homesteading, grazing, logging, recreation and Federal administration are represented by a variety of adits, portals, cabin sites, campgrounds, lookouts, telecommunication lines, wagon roads and railroad grades.

Table III-8: Documented Heritage Properties in the Swauk Allotment

Site Type	Number of Properties Known
Mining (cabin remains/sites, adits	110
Homesteads	4
Logging (railroads, bridges)	4
Lookout Tower	1
Transportation	6
Recreation	9
Guard Station	1
CCC (telephone lines/CG/roads)	4
Trapping	5
Grazing	4
Peeled Trees	1
Rock shelter	1
Lithic Scatters/Isolates	19
Total	169

A review of heritage property records revealed that 117 of the documented properties are ineligible for listing on the National Register and require no management consideration. The remaining properties remain formally unevaluated, or have been found eligible for listing on the Register. The potential effects of sheep grazing on these 52 unevaluated and eligible properties were considered.

The known impacts of sheep grazing to historic resources are largely related to displacement and breakage of artifacts, the mixing of depositional associations through trampling and potential acceleration of natural erosion processes. These effects can be lessened or magnified by factors such as the relative concentration of sheep in an area and soil conditions (e.g., hard, rocky ground versus soft or wet soil).

The effects of sheep grazing pertain directly to heritage properties consisting of or containing archaeological deposits (e.g., buried ruins and artifacts). The vast majority of documented properties known in the analysis area consist of features unlikely to be disturbed by sheep grazing: standing buildings and structures (mining cabins, recreation shelters, lookout towers), culturally modified trees (scribed aspens, peeled cedars, trees with telecommunication insulator/line), rock features and earthen pits (mining adits, talus pits), road and bridge remains, the sites of former cabins and guard stations lacking associated features or artifacts, and small rock shelters/caves lacking evidence of artifact deposits. Likewise, the locations of documented or collected isolated surface artifact discoveries (e.g., isolated lithics and projectile points), unless indicative of significant buried artifact deposits, are unlikely to be effected by either concentrated or diffuse sheep grazing.

A review of the known properties in the Swauk Sheep Allotment identified 25 with the most potential to be impacted by sheep grazing activities (see Table III-9). Potential impacts to heritage resources from sheep grazing were identified and recommendations for the continued consideration of heritage properties in administration of the allotment were developed

Table III-9: Known Heritage Properties in the Swauk Allotment Most Susceptible to Sheep Grazing Impacts

Heritage Property Type	# Properties
Ditches	4
Lithics	13
Camps/Historic Artifact Scatters	2
Ranger Station	1
Cabin Site/Remains	2
Mines	2
Historic Roads	1
Total	25

Reserved Indian Rights and Forest Service Trust Responsibility

The Swauk Sheep Allotment is located on lands ceded to the U.S. Government under the 1855 Yakima Treaty. As such, members of the Yakama Indian Nation retain certain rights and privileges. These "reserved" rights are still excised by tribal members today under tribal regulations and remain enforceable under the supremacy clause of the U.S. Constitution until extinguished by Congress. Article 3 of the Yakima Treaty defines those rights as follows:

- The exclusive right to take fish in all streams, where running through or bordering said reservation;
- The right to taking fish at all usual and accustomed places, in common with the citizens of the Territory, and of erecting temporary houses for curing them, together with;

- The privilege of hunting, gathering roots and berries, and pasturing their horses and cattle upon open and unclaimed land.

The Swauk Sheep Allotment would in no way affect the rights and privileges of the Yakama Nation. The planning area is also within the traditional use area of the Confederated Colville Tribes but the project will not affect or preclude their use of the area.

Trust responsibility is the U.S. Government's permanent legal obligation to exercise statutory and other legal authorities to protect tribal land, assets, resources, and treaty rights, as well as a duty to carry out the mandates of Federal law with respect to American Indian and Alaska Native Tribes. For the Forest Service, fulfillment of trust responsibility requires consultation with tribes. With respect to this project, both the Yakama Nation and the Confederated Colville Tribes were consulted via formal government-to-government letters that defined the project and solicited their concerns and knowledge regarding resources of interest to them within the planning area. No comments have been received to date. A report documenting a "no effect" finding for the project was signed by Jacquie Beidl, Assistant Forest Archeologist, on March 18, 2008 pursuant to the 1997 programmatic agreement regarding the management of cultural resources on National Forests in Washington State.

Heritage Resources Environmental Consequences
The analysis area under consideration is the allotment. The effects of the proposal are realized in this area.

Effect of the No Grazing Alternative (Alternative 1) on Heritage Resources
Under the No Grazing Alternative of not reauthorizing continued grazing, no direct adverse impacts to cultural properties or to the exercise of Tribal treaty rights, would be anticipated. Indirectly and cumulatively, cultural properties would no longer be subject to potential impacts from sheep grazing.

Effect of the Current Management Scenario (Alternative 2) and Adaptive Management (Alternative 3) on Heritage Resources
The reauthorization of grazing under Alternatives 2 and 3 would have no known effect on any known or undocumented cultural properties. Under both alternatives, permit renewal provides for continued monitoring of grazing practices and inspections of known or newly identified cultural properties in the allotment. The results of this work would trigger adjustments in management practices (as appropriate) to ensure that cultural resources are considered. In the event that cultural properties could not be avoided or protected, appropriate mitigation measures would be undertaken for the affected resource(s). Provided that cultural properties continue to be considered, no indirect or cumulative impacts to cultural resources are anticipated under the action alternatives.

No direct, indirect or cumulative impacts to the exercise of Native American treaty rights are known for the action alternatives. Neither the Yakama Nation nor the Confederated

Colville Tribes have identified any specific concerns relative to the existing or proposed allotment management alternatives. Under all alternatives, dialogue with the Yakama Nation and the Confederated Colville Tribes would continue and allotment management practices would be adjusted when possible to better address Tribal concerns.

Recreation Experience

Affected Environment

The Swauk allotment provides many types of year round recreation opportunities. (For the purposes of this analysis, only the recreation opportunities available and activities pursued during the snow free months are discussed). Existing recreation activities are described in Table III-10, below and include the following (specific locations are identified in the analysis file):

Table III-10: Recreation Activities Occurring within the Swauk Allotment Analysis Area

Activity	Location and Timing of Activity
Camping at developed fee recreation areas.	Swauk and Mineral Springs Campgrounds are developed fee campgrounds, operated by Thousand Trails, district concessionaires. These sites are located off of Highway 97. The BLM operates a developed campground at Wilson Creek, off of Road 9718.
Dispersed camping	Dispersed camping occurs at many traditional sites throughout the area, typically near streams. Sites are used throughout the snow free season. Preferred locations change with changing activities (summer camping areas can be somewhat different than fall hunting).
Hunting	Occurs throughout the allotment. Early season archery for big game, upland bird, small game, and special permits occur during the time livestock would use the allotment.
Four Wheel Jeep Trails and ATV use	Occurs on system four wheel drive routes throughout the snow free season (heaviest on summer weekends).
Auto touring on FS roads	Occurs on many system roads throughout the snow free months.
Hiking and horseback riding	Occurs on nonmotorized system trails and single tread motorized trails throughout the snow free season.
Motorcycle riding	Occurs on system single tread motorized trails throughout the snow free season.
Fishing	Occurs at stocked lakes and in streams.
Mountain biking	Occurs on system trails outside designated Wilderness throughout the snow free season.
Wood cutting for use at	Occurs throughout the allotment.

Table III-10: Recreation Activities Occurring within the Swauk Allotment Analysis Area	
campsites, berry/mushroom picking, bird watching & other miscellaneous activities	

Recreation Experience Environmental Consequences
The analysis area considered is the area within the allotment boundary. The effects of the proposal will be realized in this area.

Important Interactions, Direct and Indirect Effects:
A variety of recreation use occurs throughout the allotment as shown above. Depending on the individual and the activity they are pursuing, encountering livestock grazing in the forest can be perceived as either an inconvenience or nuisance, or as an interesting and unique addition to the overall recreation experience.

Encountering a band of sheep being driven down a road would be a direct effect that could add to the overall recreation experience. Watching the herders and dogs work can be reminiscent of the "Old West", and can be perceived as a unique experience most people do not experience anymore. Sheep move relatively slowly between their bed grounds, and are usually bunched together in large bands. Some recreationists have a limited amount of time in which to pursue their activity. Delays caused from encountering the sheep could raise stress levels and negatively impact those who are on a tight time schedule.

Sheep are driven in bands during the time they are on the allotment, and therefore they require large areas for bedding. If a recreationist plans on camping at a specific dispersed site for a specific time period, and they encounter sheep bedding at that site, their displacement would be a direct effect, and their recreation experience negatively impacted.

Indirect effects to the recreation experience occur after the livestock have been through an area. Sheep eat vegetation as they move and leave fecal matter behind. Vegetative screening, often sparse to begin with in this allotment, provides a measure of privacy and dust abatement at dispersed sites. Vegetation loss and the amount of fecal matter present in a location would increase the longer the livestock remained in one area. Removal of a significant amount of vegetative screening can result in a loss of privacy; an increase in the dust level; and a perceived loss of natural appearance at dispersed sites. A large amount of fecal matter left at dispersed sites could make the ground unsightly and unwelcoming. These effects could disappear in a short period of time, or may displace campers for the remainder of a season.

Effect of the No Grazing Alternative (Alternative 1) on the Recreation Experience
There would be no direct or indirect effects to recreationists from this alternative. Complaints have been received infrequently (once every few years) over the presence of sheep encountered in the forest. Some individuals have questioned the legality of sheep

being allowed to graze on National Forest. The recreation experience of these individuals would improve under this alternative. No cumulative effects to recreationists would be anticipated under this alternative.

Effect of the Current Management Scenario (Alternative 2) on the Recreation Experience

Several design criteria have been incorporated into this alternative to minimize effects to recreationists using the allotment, particularly:

- Driving the livestock to avoid developed recreation areas, including campgrounds and trailheads
- Informing the District's Special Use Permit Administrator of the turn-out dates and locations to aid in scheduling recreation events, and
- Informing the District receptionists of the livestock's general location so the public has an opportunity to be informed over their possible presence.

Most people recreating within the allotment should not be negatively impacted by this alternative. Some individuals with a lower tolerance for livestock using the same areas (especially favored dispersed camp areas) may still be negatively affected; however, based on the low amount of previous complaints, these should be few in number. Although early season big game archery hunting season begins in mid-September, those who have traditionally hunted in this area have probably grown used to the presence of sheep, as no complaints are known to exist. Those recreationists that have dogs with them may encounter the herd dogs, and the potential for conflict exists between the animals. However, the herder maintains control of the dogs.

A spring box for the water intake for Swauk Campground is near a bedground and will be monitored and protected by fencing or other means (e.g., avoidance) if protection of the water quality and the spring box intake becomes necessary. With adaptive management and associated monitoring no adverse impacts are anticipated.

There is a BLM campground that has recently been improved with updated facilitates at Wilson Creek. Coordination with BLM administrators will reduce potential negative impacts to this campground associated with moving sheep near that area.

Although this alternative has the potential to indirectly result in a slight local increase in the dust level of certain dispersed sites; the Environmental Protection Agency does not identify grazing as a contributor to the six principal air pollutants for which air quality standards have been set (2001). This alternative is not expected to affect air quality and meets the requirements of the Clean Air Act.

No cumulative effects to recreationists from this alternative are anticipated.

Effect of Adaptive Management (Alternative 3) on the Recreation Experience

Several design criteria have been incorporated into this alternative (as in Alternative 2) to minimize effects to recreationists using the allotment, particularly:

- Driving the livestock to avoid developed recreation areas, including campgrounds and trailheads.
- Informing the District's Special Use Permit Administrator of the turn-out dates and locations to aid in scheduling recreation events, and
- Informing the District receptionists of the livestock's general location so the public has an opportunity to be informed over their possible presence.

Most people recreating within the allotment should not be negatively impacted by this alternative. Some individuals with a lower tolerance for livestock using the same areas (especially favored dispersed camp areas) may still be negatively affected; however, based on the low amount of previous complaints, these should be few in number. Although early season big game archery hunting season begins in mid-September, those who have traditionally hunted in this area have probably grown used to the presence of sheep, as no complaints are known to exist. Those recreationists that have dogs with them may encounter the herd dogs, and the potential for conflict exists between the animals. However, the herder maintains control of the dogs.

A spring box for the water intake for Swauk Campground is near a bedground and will be monitored and protected by fencing or other means (e.g., avoidance) if protection of the water quality and the spring box intake becomes necessary. With adaptive management and associated monitoring no adverse impacts are anticipated.

There is a BLM campground that has recently been improved with updated facilitates at Wilson Creek. Coordination with BLM administrators will reduce potential negative impacts to this campground associated with moving sheep near that area.

Although this alternative has the potential to indirectly result in a slight local increase in the dust level of certain dispersed sites; the Environmental Protection Agency does not identify grazing as a contributor to the six principal air pollutants for which air quality standards have been set (2001). This alternative is not expected to affect air quality and meets the requirements of the Clean Air Act.

No cumulative effects to recreationists from this alternative are anticipated.

Other Required Disclosures

Irreversible or Irretrievable Commitment of Resources
There would be no irreversible or irretrievable commitment of resources.

Short-term Use versus Long-term Productivity
Grazing is a short-term use of the land. There would be no trade-off of long-term productivity at the expense of short-term use.

Probable Adverse Environmental Effects that are Unavoidable
All probable adverse environmental effects are described previously in this chapter.

Potential Conflicts with Plans or Policies of Other Jurisdictions

- Effects on threatened, endangered, and special status species are disclosed in the Biological Evaluations for plants, fish, and terrestrial wildlife previously in this chapter. There would be no adverse effects on any species to threaten viability.
- The alternatives comply with State and Federal air quality regulations because there would not be any effect on air quality.
- None of the alternatives would conflict with American Indian treaty rights or provisions. The Yakama Indian Nation and Confederated Tribes of the Colville Reservation were consulted with regarding this project but did not respond with any concerns. There are no known Alaska Native religious or cultural sites present.
- Best Management Practices would be implemented to meet State and Federal water quality regulations.

Prime Farm, Range, or Forest Land

The alternatives proposed comply with the Federal Regulations for prime land. No 'prime' forestland would be affected. The analysis area does not contain any prime rangeland or farmland.

Floodplain Management (E.O. 11988) and Protection of Wetlands (E.O. 11990)

Impacts in these areas are described previously in this the riparian and fisheries sections of this chapter.

Consumers, Civil Rights, Minority Groups, Low Income Populations and Women

None of the alternatives proposed would negatively impact women, American Indians, other minorities, or consumer groups. Civil Rights would not be affected by any of the alternatives. The project includes both permittee and Forest Service employee accomplished work. The U.S. Department of Agriculture prohibits discrimination in its employment practices based on race, color, national origin, gender, religion, age, disability, political beliefs, sexual orientation, and marital family status.

Executive Order 12898 (59 Fed. Reg. 7629, 1994) directs Federal Agencies to identify and address, as appropriate, any disproportionate effects on minority groups or low income populations. None of the alternatives proposed would have disproportionate effects on minority groups or low income populations.

Public Health and Safety

No public heath or safety associated issues are anticipated with any of the proposed alternatives. (Chapter II – Page II-9)

Forest Service Inventoried Roadless Areas and Proposed Wilderness Areas

There are portions of three Inventoried Roadless Areas (IRAs) and two Proposed Wilderness Areas (PWAs) within the Swauk Allotment boundary. IRAs within the allotment include: Teanaway Roadless Area, Devil's Gulch Roadless Area, and Lion Rock Roadless Area (Table I-4 and Map I-5, Appendix A). Draft Potential Wilderness

Areas have been identified through the Forest Plan revision process and include Teanaway PWA and Lion Rock PWAs within the project area (Table I-5 and Map I-6, Appendix A). Portions of the three roadless areas occur on the very northwest, northeast and southeast boundaries of the allotment, respectively. The primary grazing route does not enter the IRAs or the PWAs but rather occurs adjacent to them. It is possible that limited grazing would occur along the boundary as the livestock move along the established route. However, grazing does not result in any irreversible or irretrievable effects to roadless character or to unroaded areas adjacent to roadless areas. Livestock grazing does not affect manageability and boundaries for these areas, nor does it impact surrounding opportunities for primitive recreation and challenge. It may reduce the natural integrity, appearance and opportunity for solitude of the areas because livestock and their droppings may be offensive to some types of recreationists seeking a natural experience in the roadless area. Livestock grazing has been on-going in this area since the mid 20th century. These same effects would also be evident in the unroaded areas adjacent to the inventoried roadless areas. The alternatives considered under this proposal are consistent with the Roadless Area Conservation Rule (RACR, 2001) on inventoried roadless areas because prohibited activities such as road construction, road reconstruction and the cutting, sale, or removal or timber are not part of this proposal, although project design was not influenced by the RACR in any way.

Visual Quality Objectives
All alternatives proposed are consistent with the visual quality objectives of the area, which include maximum modification (33,368 acres (GF)), retention (8,572 acres (ST1, RE2)), partial retention (2,765 acres (ST2)), and preservation (267 acres (SI1)). Visual quality is not expected to change as a result of livestock grazing or associated activities. Under Alternative 2 (Current Management Scenario) and Alternative 3 (Adaptive Management), livestock and evidence of livestock grazing may be visible from roads and trails within the allotment.

Wild and Scenic Rivers
There are no existing or potentially eligible Wild and Scenic Rivers in the analysis area.

Chapter IV

List of Agencies and Persons Consulted

Scoping packets were sent to approximately 450 individuals, organizations and Federal, State and County agencies thought to have an interest in the project. A list of persons and agencies consulted during this process can be located in the analysis file.

The following individuals commented or expressed interest in the project:

- Martinez Livestock Inc., Mark and Nick Martinez
- Dan Peterson, Range Management Specialist, BLM
- Anonymous telephone inquiry regarding timeline and information gathering

Agencies consulted:

- NOAA Fisheries Service
- U.S. Fish and Wildlife Service
- Washington State Department of Fish and Wildlife
- State Historic Preservation Officer
- Yakama Indian Nation

Chapter V

The Public's Involvement

Introduction

This chapter summarizes public involvement for the environmental analysis. Issues, concerns and alternatives brought forth through public involvement are summarized, and individuals and agencies consulted as part of the scoping process are identified. Copies of all correspondence and meeting notes are located in the analysis file.

Chronological Summary of Public and Agency Involvement

Jan.-March, 2008

Identification of proposal in Schedule of Proposed Actions. The project was identified in the Schedule of Proposed Actions (SOPA) for the Okanogan-Wenatchee National Forests. The project has remained on the SOPA throughout the planning process and is identified on the current SOPA.

Feb 7, 2008

Meeting with permittee. IDT leader and range technician met with the permittee to discuss issues and potential alternatives and to confirm the feasibility of implementing the proposal.

April 21, 2008

Scoping letters mailed. Formal public involvement was initiated when a description of the proposed action was mailed to approximately 450 individuals, organizations and Federal, State and County agencies thought to have an interest in the project. A list of persons and agencies consulted during this process can be located in the analysis file.

One e-mail response and one telephone response were received during the initial scoping period April 21 – May 21. The Bureau of Land Management responded regarding coordination of the loadout site at the Liberty heliport and that the provisions for management of that area were consistent with the documentation they currently had on record (2000 EA). Following review of the provisions re: number of livestock, number of days allowed and restrictions associated with grazing in riparian areas and occupied campsites, it was determined that there would be

consistency through implementation of design criteria and best management practices.

The telephone call was an inquiry regarding timeline and information gathering. This scoping effort did not result in identification of any significant issues or controversy regarding the proposal.

June 3, 2008 — **Meeting with U.S. Fish and Wildlife Service and NOAA Marine Fisheries Service.** The IDT leader, IDT wildlife biologist, and IDT fisheries biologist met with the U.S. Fish and Wildlife Service and NOAA Marine Fisheries biologists to initiate Level 1 consultation under Section 7 of the Endangered Species Act. Letters of Concurrence have been received from both U.S. Fish and Wildlife Service (dated November 14, 2008) and NOAA Marine Fisheries

November 14, 2008 — **Meeting with permittee.** IDT leader and range technician met with the permittee to discuss draft alternatives and to confirm the feasibility of implementing the proposal.

March 26, 2009 — **Meeting with permittee.** Range technician met with the permittee to discuss final range of alternatives.

Chapter VI

References Cited

1995 Rescission Act. Section 2001(b) of Public Law 104-19.

Abrahams, A.D., A.J. Parsons and S. Luk. 1988. Hydrologic and sediment responses to simulated rainfall on desert hillslopes in southern Arizona. CATENA 15:105-117.

Agee, J.K. 1993. Fire ecology of Pacific Northwest Forests. Island Press, Washington, D.C.

Agee, J. 1994. Fires and weather disturbances in terrestrial ecosystems of the Eastern Cascades. Gen. Tech. Rep. PNW-GTR-320. Portland, OR: U.S.D.A. Forest Service, Pacific Northwest Research Station. 52p.

Alderfer, R.B. and R.R. Robinson. 1947. Runoff from pastures in relation to grazing intensity and soil compaction. J. Amer. Society of Agron. 39:949-958.

Altmon, R. 2000. Conservation strategy for the conservation of landbirds on east slope of the Cascades Mountains in Washington and Oregon. Oregon Washington Partners In Flight. 131pp. Available on-line @ http://orwapif.org

Altman, R. and A. Holmes. 2000. Conservation strategy for the conservation of landbirds in the Columbia Plateau of eastern Oregon and Washington. Oregon-Washington Partners In Flight. Available on-line @ http://orwapif.org

Anderson, D.E., K.T. Harper and S.R. Rushforth. 1982. Recovery of cryptogamic soil crusts from grazing on Utah winter ranges. J. Range Manage. 35:355-359.

Anderson, D.J. 1971. Pattern in desert perennials. J. Ecol. 59:555-560.

Anderson, J.E., and K.E. Holte. 1981. Vegetation development over 25 years without grazing on sagebrush-dominated rangeland in southeastern Idaho. J. Range Manage. 34:25-29.

Anderson, Steve. Unpublished. 1993. Livestock Management Effects on Wildlife, Fisheries, and Riparian Areas: A Selected Literature Review. Humboldt National Forest.

Archer, S. 1989. Have southern Texas savannas been converted to woodlands in recent history? The Amer. Natur. 134:545-561.

Archer, S. and F. Smeins. 1991. Ecosystem level processes, p. 109-140. *In:* R.K. Heitschmidt and J.W. Stuth, (eds.), Grazing management: An ecological perspective, Timber Press, Portland.

Astatt, P.R. and D.J. O'Dowd. 1976. Plant defense guilds. Science 193:24-29.

Banci, V. 1994. Wolverine. Pages 99-127 *in* L. F. Ruggiero, E. B. Aubry, s. W. Buskirk, L. J. Lyon, and w. J. Zielinski techn. eds. **The scientific basis for conserving forest carnivores: American marten, fisher, lynx, and wolverine in the western United Sates.** General Technical Report RM-254. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. Available on-line @ http://www.fs.fed.us/rm/pubs_rm/rm_gtr254.html

Barrow, N.J. 1967. Some aspects of the effects of grazing on the nutrition of pastures. Austr. Agr. Sci. 33:254-257.

Beedlow, P.A., P. Van Voris and L.E. Rogers. 1988. Theoretical perspective on ecosystem disturbance and recovery, p. 257-269. *In:* W.H. Rickard, L.E. Rogers, B.E. Vaughan and S.F. Leibetrau (eds.), Shrubb-steppe: balance and change in a semi-arid terrestrial ecosystem. Elsevier, N.Y.

Belsky, A.J. 1986. Does herbivory benefit plants? A review of the evidence. Am. Nat. 127:870-892.

Bilbrough, C.J. and J.H. Richards. 1993. Growth of sagebrush and bitterbrush following simulated winter browsing: mechanisms of tolerance. Ecology 74:481-492.

Blackburn, W.H. 1975. Factors influencing infiltration rates and sediment production of semi-arid rangelands in Nevada. Water Resources Res. 11:929-937.

Blackburn, W. H. 1983. Livestock Grazing Impacts on Watersheds. Rangelands 5(3) June 1983. p 123-125.

Blaisdell, J.P. and R.C. Holmgren. 1984. Managing intermountain rangelands-Salt Desert Shrub Ranges. Gen Tech. Rep. INT-163:52. Ogden. UT: Intermountain Forest and Range Experiment Station.

Bock, C.E., V.A. Saab, T.D. Rich, and D.S. Dobkin. 1992. Effects of Livestock Grazing on Neotropical Migratory Landbirds in Western North America. Pages 296-309 in D.M. Finch and P.W. Strangel eds. Status and Management of Neotropical Migratory Birds. Gen Tech Rep RM-229. Fort Collins, CO. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station.

Bracken, E. and J. Musser. 1993. Colockum elk study, completion report. Unpubl. rep., Washington Department of Fish and Wildlife, Yakima, WA. 114pp.

Branson, F.A., G.F. Gifford, K.G. Renard, and R.F. Hadley. 1981. Rangeland hydrology. Second Edition. Society for Range Management Range Science Series 1, Denver,Colorado, USA.

Briske, D.D. 1991. Developmental morphology and physiology of grasses. *In:* R.K. Heitschmidt and J.W. Stuth (eds.). Grazing management: an ecological perspective. Timber Press, Portland, Oregon.

Bureau of Fisheries. 1936. River system stream survey – Yakima Basin.

Caldwell, M.M. 1984. Plant requirements for prudent grazing. *In:* Developing strategies for rangeland management. Westview Press. Boulder, CO.

Carter, S. and C. Holstine. 1994. *In*: Holestine, C., Editor. An Historical Overview of the Wenatchee National Forest. Eastern Washington University Reports in Archaeology and History 100-80 Archaeological and Historical Services. U.S.D.A. Forest Service. PNW Region.

Chew, R.M. 1974. Consumers as regulators of ecosystems: an alternative to energetics. Ohio J. Sci. 74:359-370.

Cook, C.W. and J. Stubbendieck. 1986. Range research: basic problems and techniques. Society for Range Management, Denver, CO.

Crawley, M.J. 1983. Herbivory: The dynamics of animal-plant interactions. Blackwell, Oxford.

Croft, A.R., L. Woodward and D.A. Anderson. 1943. Measurement of accelerated erosion on range-watershed land. J. Forestry. 41:112-116.

Davidson, F.A. 1953. The Development of the Yakima River Basin for irrigation and its effect on the migratory fish populations in the river. Report, Yakima Indian Nation.

Day, T.A. and J.K. Detling. 1990. Grassland patch dynamics and herbivore grazing preference following urine deposition. Ecology 71:180-188.

Dutoit, J.T. 1990. Home range-body mass relations-a field study on African browsing ruminants. Oecologia.85:301-303.

Dyer, M.I., J.K. Detling, D.C. Coleman and D.W. Hilbert. 1982. The role of herbivores in grasslands, p. 255-295. *In:* J.R. Estes, R.J. Tyrl and J.N. Brunken (eds.). Grasses and Grasslands-Systematics and Ecolgy. Univ. Oklahoma Press, Norman.

Eckert, R.E., Jr., F.F. Peterson, M.S. Meurisse and J.L. Stephens. 1986. Effects of soil surface morphology on emergence and survival of seedling in big sagebrush communities. J. Range Manage. 39:414-420.

Ellison, L. 1960. Influence of grazing on plant succession of rangelands. Bot. Rev. 26:1-141.

Executive Office of the President. Council on Environmental Quality. June 24, 2005. Memorandum: Guidance on the consideration of past actions in cumulative effects analysis. From James L. Connaughton, Chairman.

Forbes, P. 2004. Biological Evaluation of the Manastash Allotment Management Complex. Unpubl. rep. on file at the Cle Elum Ranger Station.

Franklin, J.F. and C.T. Dyrness. 1973. Natural vegetation of Oregon and Washington. Gen. Tech. Rep. PNW-8. U.S.D.A. Forest Service, Pacific Northwest Forest and Range Experiment Station. Portland, OR. 417p.

Froelich, H. A., McNabb, D. H. 1983. Minimizing Soil Compaction in Pacific Northwest Forests. IN: Earl L. Stone (Ed) Forest soils and Treatment Impacts. Proc. Of Sixth North American Forest Soils Conference. Univ. of Tenn. Conferences, 2016 Lake Ave., Knoxville. June 1983. pp. 159-192.

Frost, P.G. H and F. Robertson. 1987. The ecological effects of fire in savannas, p. 93-141. *In:* B.H. Walker (ed.). Determinants of tropical savannas. Int. Union Biol. Sci,. Paris, France.

Gaines, W.L. 2008. Northern spotted owl recovery plan: project consistency assessment (draft). Unpublished report on file at the Cle Elum Ranger Station. 3pp.

Gaines, W. L., Singleton, P. H. and R.C. Ross. 2003. Assessing the cumulative effects of linear recreation routes on wildlife habitats on the Okanogan and Wenatchee National Forests. Gen. Tech. Rep. PNW-GTR-586. U.S. Department of Agriculture, Forest Service. Pacific Northwest Research Station, Portland, OR. 79 pp. Available on-line @ http://www.fs.fed.us/pnw/pubs/gtr586.pdf

Gessman, J.A. and J.A. MacMahon. 1984. Mammals in ecosystems: their effects on the composition and production of vegetation. Acta Zool. Fenn. 172:11-18.

Gifford, G. F. 1981. Watershed responses to grazing management. *In* Proc., Interior West Watershed Management, April 8-10, 1980. Spokane, WA: 147:159. Washington State University Cooperative Extension. Pullman, WA.

Gifford, G.F. and R.H. Hawkins. 1978. Hydrologic impact of grazing on infiltration: a critical review. Water Resources Res. 14:305-313.

Gilbert, C.H. and B.W. Evermann. 1984. A report upon investigations in the Columbia River Basin, with descriptions of four new species of fishes. Bull. U.S. Fish Commission.

Grime, J.P. 1973. Control of species density in herbaceous vegetation. J. Environ. Manage. 1:151-167.

Grime, J.P. 1979. Plant strategies and vegetation processes. John Wiley and Sons. New York.

Hallock, M. and P.E. Nongillo. 1998. Washington state status report for the pygmy whitefish. Washington Department of Fish and Wildlife. Olympia, WA. September 1998. 20 pgs.

Hamilton, B.A., K.J. Hutchinson, P.C. Annis and J.B. Donnelly. 1973. Relationships between the diet selected by grazing sheep and the herbage on offer. Austr. J. Agr. Res. 24:272-277.

Harper, K.T. and J.R. Marble. 1988. A role for non-vascular plants in management of arid and semi-arid rangelands. *In:* P.T. Tueller (ed.), Application of Plant Sciences to Rangeland Management Inventory. Marinus Nijhoff/W. Junk, Amsterdam.

Harrod, R.J. 1993.

Heady, A.F. 1975. Rangeland management. McGraw-Hill, N.Y.

Hendrix, S.D. 1979. Compensatory reproduction in a biennial herb following insect defoliation. Oecologia (Berlin) 42:107-118.

Hessburg, P.F., R.G. Mitchell and G.M. Filip. 1994. Historical and current roles of insects and pathogens in eastern Oregon and Washington forested landscapes. Gen. Tech. Rep. PNW-GTR-327. Portland, OR: U.S.D.A. Forest Service, Pacific Northwest Research Station. 72p.

Hilbert, D.W., D.M. Swift, J.K. Detling and M.I. Dyer. 1981. Relative growth rates and the grazing optimization hypothesis. Oecologia. 51:14-18.

Hill, A. 1991. Grazing as a management tool. Wildflower Nat. Wildflower Res. Center 4:13-18.

Hobbs, N.T. 1996. Modification of ecosystems by ungulates. Journal of Wildlife Management. 60(4):695-713.

Hobbs, N.T., D.L. Baker, G.D. Bear and C. Bowden. 1996a. Ungulate grazing in sagebrush grassland: mechanisms of resource competition. Ecol. App. 5:207-224.

Hodgkinson, K.C., M.M. Ludlow, J.J. Mott and Z. Baruch. 1989. Comparative responses of the savannah *Cenchrus ciliaris* and *Themeda triandra* to defoliation. Oecologia 79:45-52.

Hoffman, T.L. and C.L. Wambolt. 1996. Growth response of Wyoming big sagebrush to heavy browsing by wild ungulates. *In:* Barrow, J.R.,M.E. Durant, R.E. Sosebee and R.J. Tausch., (comps.). Proceedings: shrubland ecosystem dynamics in a changing

environment; 1995 May 23-25; Las Cruces, NM. Gen. Tech. Rep. INT-GTR-338. Ogden, UT: U.S.D.A., Forest Service, Intermountain Research Station.

Holechek, Jerry 1980. Livestock grazing impacts on rangeland ecosystems. Journal of Soil and Water July- August p 162-164.

Holechek, J.L. and T. Stephenson. 1983. Comparison of big sagebrush vegetation in northcentral New Mexico under moderately grazed and grazing excluded conditions. J. Range Manage. 36:455-456.

Holling, C.S. 1973. Resilience and stability of ecological systems. Ann. Rev. Ecol. Systematics 4:1-23.

Hull, A.C., Jr. 1976. Rangeland use and management in the Mormon west, *In:* Sym. on agriculture, food and man-century of progress. Brigham Young Univ., Provo, UT.

Humphrey, R. 1962. Range ecology. The Ronald Press Company. New York, N.Y.

Huntly, N. 1991. Herbivores and the dynamics of communities and ecosystems. Annu. Rev. Ecol. Syst. 22:477-503.

Inouye, D.W. 1982. The consequences of herbivory: a mixed blessing for *Jurines mollis*. Oikos 39:269-272.

Interagency Grizzly Bear Committee. 1986. Interagency Grizzly Bear Guidelines. Denver, Colorado. 100 pp.

Irwin, L.L., J.G. Cook, R.A. Riggs and J.M. Skovlin. 1994. Effects of long-term grazing by big game and livestock in the Blue Mountains forest ecosystems. U.S.D.A. Forest Service, Pacific Northwest Research Station. Gen. Tech. Rep. PNW-GTR-325. Portland OR. 49p.

Johansen, J.R. 1986. Importance of cryptogamic soil crusts to arid rangelands: Implications for short duration grazing, p.127-136. *In:* J.A. Tiedeman (ed.), Short Duration Grazing: Proc. Of a short course. Wash. State Univ. Pullman, WA.

Johnson C.G. Jr., R.R. Clausnitzer, P.J. Mehringer, and C.D. Oliver. 1994. Biotic and abiotic processes of eastside eccosystemes: the effects of management on plant community ecology, and on stand and landscape vegetation dynamics. U.S.D.A. Forest Service Pacific Northwest Research Station. GTR-PNW-GTR-322.

Johnson, C.W. and W.H. Blackburn. 1989. Factors contributing to sagebrush rangeland soil loss. Trans. ASAE 32:155-160.

Johnson, K.L.1992. Management for water quality on rangelands through best management practices: the Idaho approach, p. 415-441. *In:* R.J. Naiman, (ed.).

Watershed management : balancing sustainability and environmental change. Springer-Verlag. New York, N.Y.

Johnson, D.H., and T.A. O'Neil. 2001. Wildlife habitat relationships in Oregon and Washington. Oregon State University Press, Corvallis, OR. 736 p.

Kindschy, R.R. 1987. Sagehen exclosure: A history of bitterbrush reproduction. Rangelands 9:113-114.

Kittitas web soil survey http://websoilsurvey.nrcs.usda.gov/app/

Klubek, B. and J. Skujins. 1980. Heterotrophic N_2-fixation in arid soil crusts. Soil Biol. Biochem. 12:229-236.

Knight, D.H. 1987. Parasites, lightning and the vegetation mosaic in wildernedd landscapes, p. 59-83. *In:* M.G. Turner (ed.). Landscape heterogeneity and disturbance. Springer-Verlag, New York, N.Y.

Laurenroth, W.K., D.G. Milchunus, J.L. Dodd, R.H. Hart R.K. Heitschmidt and L.R. Rittenhouse. 1994. Grazing in the Great Plains of the United States, p. 69-100. *In:* Ecological implications of livestock herbivory in the west. Society for Range Management. Denver, CO.

Laycock, W.A. 1967. How heavy grazing and protection affect sagebrush-grass ranges. J. Range Manage. 20:206-213.

Laycock, W.W. 1994. Implications of grazing vs. no grazing on today's rangelands. *In:* Ecological implocations of livestock herbivory in the west. M. Vavra, W.A. Laycock and R.D. Peiper. (eds.). Society for Range Management. Denver, CO.

Linnartz, N.E., C.Y. Hse and V.L. Duval. 1966. Grazing impairs physical properties of a forest soil in central Louisiana. J. For. 239-243.

Lull, H. W., 1959. Soil Compaction on Forest and Range Lands. United States Department of Agriculture Washington D.C. pp1-33.

Mack, R.N., and J.N. Thompson. 1982. Evolution in steppe with few large, hoofed mammals. Amer. Natur. 119:757-773.

Malin, J.C. 1955. The grasslands of North America: its occupance and the challenge of continuous reappraisals, p350-366. *In:* W.L. Thomas (ed.). International Symposium: Man's Role in Changing the Race of the Earth. Univ. of Chicago Press, Chicago, IL.

Marble, J.R. and K.T. Harper. 1989. Effect of timing of grazing on soil-surface cryptogamic communities in a Great Basin low shrub desert: A preliminary report. Great Basin Natur. 49:104-107.

Martin, et al. 1994. Rainbow trout distribution and population abundance variation in the upper Yakima River Basin. Chapter 4 in Pearsons et al, 1994. Annual report for FY1993. Bonneville Power Administration, Portland, Oregon.

Maschinski, J. and T.G. Whitham. 1989. The continuum of plant responses to herbivory: The influence of plant association, nutrient availability, and timing. Am. Nat. 134:1-19.

May, R.M. 1977. Thresholds and breakpoints in ecosystems with a multiplicity if stable states. Nature 269:471-477.

McConnell, B.R. and J.G. Smith. 1970. Response of understory vegetation to ponderosa pine thinning in eastern Washington. J. Range Manage. 23:208-212.

McDonald, M. 1895. The salmon fisheries of the Columbia River Basin. Bull. U.S. Fish Commission, Vol. XIV.

McMichael, GM, et al. 1992. Yakima River species interactions studies. Annual Report for FY1991. Bonneville Power Administration, Portland, Oregon.

McNaughton, S.J. 1976. Serengeti migratory wildebeest: facilitation of energy flow by grazing. Science 191:92-94.

McNaughton, S.J. 1979. Grazing as an optimization process: grass-ungulate relationships in the Serengeti. Am. Nat. 113-691-703.

McNaughton, S.J. 1983. Compensatory plant growth as a response to herbivory. Oikos 40:329-336.

McNaughton, S.J. 1984. Grazing lawns: animals in herds, plant form and coevolution. The Amer. Natur. 124:863-886.

McNaughton, S.J. 1985. Ecology of grazing ecosystem: the Serengeti. Ecol. Mongr. 55:259-294.

McNaughton, S.J., 1992. The propagation of disturbance in savannas through food webs. J. Veget. Sci. 3:301-314.

McNaughton, S.J., R.W. Ruess and S.W. Seagle. 1988. Large mammals and process dynamics in African ecosystems. BioScience 38:794-800.

Meeuwig, R.O. 1965. Effects of seeding and grazing on infiltration capacity and soil stability of a subalpine range in central Utah. J. Range Manage. 18:173-180.

Milchunas, D.G., O.E. Sala and W.K. Laurenroth. 1988. A generalized model of the effects of grazing by large herbivores on grassland community structure. Amer. Nat. 132:87-106.

Miller, F.M., T.J. Svejcar and N.E. West. 1994. Implications of livestock grazing in the intermountain sagebrush region: plant composition. *In:* Ecological Implications of Livestock Herbivory in the West. M. Vavra, W. Laycock and R. Pieper, (eds.) Society for Range Management, Denver, CO: 297p.

Mueggler, W.F. 1950. Effects of spring and fall grazing by sheep on vegetation of the Upper Snake River Plains. J. Range Manage. 3:308-315.

Mueggler, W.F. 1970. Influence of competition on the response of Idaho fescu to clipping. U.S.D.A. For. Serv. Res. Paper INT-73.

Mueggler, W.F. 1972. Influence of competition on the response of bluebunch wheatgrass to clipping. J. Range Manage. 25:88-92.

National Research Council. 1994. Rangeland health: new methods to classify, inventory, and monitor rangelands. National Academy Press. Washington, D.C. 180p.

Noy-Meir, I. 1993. Compensating growth of grazed plants anad its relevance to the use of rangelands. Ecol. Appl. 3:17-20.

Oliver, C.D., L.L. Irwin, and W.H. Knapp. 1994. Eastside Forest Management Practices: Historical Overview, Extent of their Applications, and Their Effects on Sustainability of Ecosystems. U.S.D.A. Forest Service. General Technical Report PNW-GTR-324. Pacific Northwest Research Station.

Owen, D.F. 1980. How plants may benefit from the animals that eat them. Oikos 35-230-235.

Owen, D.F. and R.G. Wiegert. 1976. Do consumers maximize plant fitness? Oikos 27:488-492.

Paige, K.N. and T.G. Whitham. 1987. Overcompensation in response to mammalian herbivory: the advantage of being eaten. Am. Nat. 129:407-416.

Parton, W.J., A.R. Mosier and D.S. Schimmel. 1988. Rates and pathways of nitrous oxide production in a shortgrass steppe. Biogeochemistry 6:45-58.

Pastor, J., R.J. Naiman, B. Dewey and P. McInnes. 1988. Moose, microbes and the boreal forest. BioScience. 38:770-777.

Patric J.H. and J.S. Helvey. 1986. Some effects of grazing on soil and water in the eastern forest. U.S.D.A., Forest Service, Northeastern For. Exp. Sta. NE-GTR-115.

Pearsons, T.N., et al. 1993. Yakima species Interactions Study, Annual Report for FY1992. Bonneville Power Administration, Portland, Oregon. Publication located at web site: www.efw.bpa.gov/cgi-bin/efw/FW/publications.cgi.

Pearsons, T.N., et al. 1996. Yakima species Interactions Study, Annual Report for FY1994. Bonneville Power Administration, Portland, Oregon. Publication located at web site: www.efw.bpa.gov/cgi-bin/efw/FW/publications.cgi.

Pearsons, T.N., et al. 1998. Yakima River species Interactions Studies, Progress Report, 1995-1997. Bonneville Power Administration, Portland, Oregon. Publication located at web site: www.efw.bpa.gov/cgi-bin/efw/FW/publications.cgi.

Pearsons, T., A. Fritts, G. Temple, C. Johnson and M. Schmuck. 2002. "Yakima River Species Interactions Studies", Project No. 1995-296424, 69 electronic pages (BPA Report DOE/BP-00004666-10).

Peet, R.K., D.C. Glenn-Lewin and J.W. Wold. 1983. Predictions of man's impact on vegetation, p. 324-338. *In:* W. Holzner, M.J., A. Werger and I. Ikusiam (eds.). Junk Pub., The Hague.

Pickett, S.T.A. and P.S. White. 1986. Patch dynamics: a synthesis, p. 371-384. *In:* Pickett S.T.A. and P.S. White (eds.). The ecology of patch disturbances and patch dynamics. Academic Press. San Diego, CA.

Pieper, R.D. 1977. Effects of herbivores on nutrient cycling and distribution. *In*: The impacts of herbivores and arid and semi-arid rangelands. Proc. 2nd U.S./Australia Rangeland Panel. Austr. Rangeland Soc., Perth, Austr

Pieper, R.D. 1994. Ecological implications of livestock grazing. *In:* Ecological Implications of Livestock Herbivory in the West. M. Vavra, W. Laycock and R. Pieper, (eds.). Society for Range Management, Denver, CO: 297p.

Pieper, R.D. and R.K. Heitchmidt. 1988. Is short-duration grazing the answer? J. Soil and Water Cons. 43:133-137.

Platts, W. 1981. Effects of livestock grazing. Gen. Tech. Rep. PNW-124. Portland, OR: USDA Forest Service, Pacific Northwest Research Station. 25 p.

Platts, W.S. 1991. Livestock grazing. American Fisheries Society Special Publication 19:389-424

Porter, K.G. 1976. Enhancement of algal growth andproductivity by grazing zooplankton. Science 192:1332-1334.

Rashin, E.B., C.J. Clishe, A.T. Loch, and J.M. Bell. 2006. Effectiveness of Ti,ber harvest Practices for Controllong Sediment Related Water Quality Impacts. Journal of the American Water Resources Association 42(5):1307-1327.

Rickard, W.H. and B.E. Vaughan. 1988. Plant communities: characteristics and responses, p. 109-181. *In:* W.H. Rickard, L.E. Rogers, B.E. Vaughan and S.F. Liebetrau (eds.). Shrub-steppe: balance and change in a semi-arid terrestrial ecosystem. Elsevier, N.Y.

Robertson, J.H. 1971. Changes on grass-shrub range in Nevada ungrazed for 30 years. J. Range Manage. 24:397-400.

Ross, B.A., J.R. Bray and W.H. Marshall. 1970. Effects of long-term deer exclusion on Pinus resinoa forst in north-central Minnesota. Ecology. 51:1088-1093.

Ruediger, Bill, J. Clarr, S. Gniadek, B. Holt, L. Lewis, S. Mighton, B. Naney, G. Patton, T. Rinaldi, J. Trick, A. Vandehey, F. Wahl, N. Warren, D. Wenger, and A. Williamson. 2000. Canada Lynx Conservation Assessment and Strategy. USDA Forest Service, USDI Fish and Wildlife Service, USDI Bureau of Land Management, and USDI National Park Service. Forest Service Publication #R1-00-53, Missoula, MT. 142 pp.

Ruess, R.W. and S.J. McNaughton. 1987. Grazing and the dynamics of nutrient and energy regulated microbial processes in the Serengeti grasslands. Oikos 49:101-110.

Rummell, R.S. 1951. Some effects of livestock grazing on ponderosa pine forest and range in central Washington. Ecology 32(4):594-607.

Sanchez, C.E. and M.K. Wood. 1987. The relationship of soil surface roughness with hydrologic variables on natural and reclaimed rangeland in New Mexico. J. Hydrol. 94:345-354.

Sanders, K.D. and A.A. Voth. 1983. Ecological changes of grazed and ungrazed plant communities, p176-179. *In:* Managing intermountain rangelands-improvement of range and wildlife habitats. U.S.D.A. For. Serv. Gen Tech. Rep. INT-157.

Satterlund, D.R. 1972. Wildland watershed management. New York: Wiley.

Schimel, D.S., W.J. Parton, P.J. Adamsen, R.G. Woodmasee, R.L. Senft and M.A. Stillwell. 1986. The role of cattle in the volatile loss of nitrogen from shortgrass steppe. Biogeochemistry 2:39-52.

Schlatterer, E.F. and E.W. Tisdale. 1969. Effects of litter of *Artemisia, Chrysothamnus* and *Tortula* on germination and growth of three perennial grasses. Ecology 50:869-873.

Sheley, R.L., T.J. Svejcar, B.D. Maxwell, and J.S. Jacobs. 1996. Successional rangeland weed management. Rangelands. 18(4): p. 155-9.

Shiflet, T.N. (ed.). 1994. Rangeland cover types. Society for Range Management. Denver, CO: 152p.

Simberloff, D., B.J. Brown and S. Lowrie. 1978. Isopod and insect root borers may benefit Florida mangroves. Science 201:630-632.

Simpson, J.R. 1968. Losses of urea nitrogen from the surface of pasture soils, p. 89-93. Trans. 9th Inter. Congr. Soil Sci. Adelaide, Australia.

Singleton, P. H., Gaines, W.L., Leingang, J., Davis, C., and J. F. Lehmkuhl. A Bayesion belief network assessment of habitat for the Colockum and Yakima elk herd, Washington, DRAFT May 4, 2007. Unpubl. rep., on file at the Cle Elum Ranger Station.

Sneva, F.A., R.L. Rittenhouse, P.T. Tueller and P. Reece. 1984. Changes in protected and grazed sagebrush-grass in eastern Oregon, 1937-1974. Agric. Exp. Sta. Oregon State Univ. Sta. Bull. 663.

Spence, B.C., G.A. Lomnicky, R.M. Hughes, R.P.Novitzki 1996. An ecosystem approach to salmonid conservation. TR-4501-96-6057. Mantech Environmental Research Services Corp., Corvallis, OR.

St. Clair, L.L., B.L. Webb, J.R. Johansen and G.T. Nebeker. 1984. Cryptogamic soil crusts: enhancement of seedling establishment in disturbed and undisturbed areas. Reclam. Reveg. Res. 3:129-136.

Stenseth, N.C. 1978. Do grazers maximize individual plant fitness. Oikos 31:299-306.

Stoddart, L.A. and D.A. Smith. 1943. Range management. McGraw-Hill Book Co., New York.

Stronach, R.H. and S.J. McNaughton. 1989. Grassland fie dynamics in the Serengeti ecosystem and a potential method for retrospectively estimating fire energy. J. Appl. Ecol. 26:1025-1033.

Tepler Field Notes, 2007.

Tepler Field Notes, 2008.

Tiedemann, A.R. and H.W. Berndt. 1972. Vegetation and soils of a 30-year deer and elk exclosure in central Washington. Northwest Sci. 46:59-66.

Tiedemann, A.R., H.R. Sanderson and N.J. Cimon. 1986. Future site productivity considerations of short-duration, high-intensity grazing, p.137-144. *In:* J.A. Tiedemann (ed.). Short Duration Grazing. Washington State Univ. Pullman, WA.

Tisdale, E.W., M. Hironaka and M.A. Fosberg. 1969. The sagebrush region in Idaho. Univ.Idaho Agr. Exp. Sta. Bull. 512.

Troeh, F.R., J.A. Hobbs and R.L. Donahue. 1991. Soil and water conservation. Englewood Cliffs, N.J.: Prentice-Hall.

Turner, M.G. and S.P. Bratton. 1987. Fire, grazing and the landscape heterogeneity of a Georgia barrier island, p. 85-101. *In:* M.G. Turner (ed.). Landscape heterogeneity and disturbance. Springer-Verlag. New York, N.Y.

U.S.D.A. 2004. Landtype Associations of Central Washington. On-file at Okanogan-Wenatchee National Forest Headquarters, 215 Melody Lane, Wenatchee, WA. 98801.

U.S.D.A. Forest Service. 2005. Forest Service Manual 2670.

U.S.D.A. Forest Service. 2005. Forest Service Manual 2210.

U.S.D.A. Forest Service. 1988. General Water Quality Best Management Practices. Pacific Northwest Region.

U.S.D.A. Forest Service. 1989. Livestock grazing success on public range. Program Aid Number 1439.

U.S.D.A. Forest Service. 2004. Sensitive Species Plant List, Region 6.

U.S.D.A. Forest Service. 2005. Pacific Northwest Region Invasive Plant Program: Preventing and Managing Invasive Plants. Final Environmental Impact Statement and Record of Decision. Portland, OR.

U.S.D.A Forest Service. 2008. *Regional Forester's Sensitive Species List.* January 2008. http://www.fs.fed.us/r6/sfpnw/issssp/agency-policy/

U.S.D.A. Forest Service, Okanogan-Wenatchee National Forest. 2002. Okanogan and Wenatchee National Forest Weed Management and Prevention Strategy and Best Management Practices.

U.S.D.A. Forest Service, Okanogan-Wenatchee National Forest. 2004. Forest Fish Distribution Database. Unpublished data.

U.S.D.A. Forest Service, Okanogan-Wenatchee National Forest. Swauk Allotment Annual Operating Instructions. 2004-2009. On-file at Naches Ranger District.

U.S.D.A. Forest Service, Wenatchee National Forest. 1990. Wenatchee National Forest Land and Resource Management Plan.

U.S.D.A. Forest Service, Wenatchee National Forest. 1997. Wenatchee National Forest Late-Successional Reserve and Managed Late-Successional Area Assessment.

U.S.D.A. Forest Service, Wenatchee National Forest. 1997a. Swauk Watershed Assessment. Cle Elum Ranger District.

U.S.D.A. Forest Service, Wenatchee National Forest. 2000. Monitoring Report for the Land and Resource Management Plan. Wenatchee National Forest Fiscal Year 1999.

U.S.D.A. Forest Service, Wenatchee National Forest. 2001. Management of *Cypripedium fasciculatum* on the Okanogan Wenatchee National Forests.. Okanogan Wenatchee and National Forests. Wenatchee Washington.

U.S.D.A. Forest Service and U.S.D.I. Bureau of Land Management. 1994. Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl and Standards and Guidelines for Management of Habitat of Late-Successional and Old-Growth Related Species Within the Range of the Northern Spotted Owl.

U.S.D.A. Forest Service and U.S.D.I. Bureau of Land Management. 1997. Survey Protocols for Survey and Manage Component 2 Bryophytes, Version 2.

U.S.D.A. Forest Service and U.S.D.I. Bureau of Land Management. 1997a. Survey Protocols for Protection Buffer Bryophytes, Version 2.

U.S.D.A. Forest Service and U.S.D.I. Bureau of Land Management. 1998. Survey Protocols for *Bridgeoporous nobilissimus* Fungi. Version 2.

U.S.D.A. Forest Service and U.S.D.I. Bureau of Land Management. 1998a. Survey Protocols for Survey and Mange Strategy 2 Vascular Plants, Version 2.

U.S.D.A. Forest Service and U.S.D.I. Bureau of Land Management. 1998b. Survey Protocols for Component 2 Lichens, Version 2.

U.S.D.A. Forest Service and U.S.D.I. Bureau of Land Management. 2001. Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and Other Mitigation Measures Standards and Guidelines.

U.S.D.A. Forest Service and U.S.D.I. Fish and Wildlife Service. 2000. Lynx Conservation Agreement. USFS Agreement #00-MU-11015600-013. 12pp.

U.S.D.A. Forest Service and U.S.D.I. Fish and Wildlife Service. 2006. Amended Lynx Conservation Agreement. USFS Agreement #00-MU-11015600-013, amended.

U.S.D.A. Natural Resources Conservation Service. 1996. Soil Quality Information Sheet. April 1996.

U.S.D.A. Natural Resources Conservation Service. 2006. Climatological Data for Washington State

U.S.D.I. Fish and Wildlife Service. 1997. Grizzly Bear Recovery Plan, Supplement: North Cascades Ecosystem Recovery Plan Chapter. Prepared by: Dr. Christopher Servheen, Grizzly Bear Recovery Coordinator, USFWS, Forestry Sciences Laboratory, University of Montana, Missoula, MT 59801. 24 pp.

U.S.D.I. Fish and Wildlife Service. 2008. Final Recovery Plan for the Northern Spotted Owl, *Strix occidentalis caurina.* U.S. Fish and Wildlife Service, Portland, Oregon. Xii + 142 pp.

Vickery, P.J. 1972. Grazing and net primary production of a temperate grassland. J. Appl. Ecol. 9:307-314.

Von Wilpert K. and Jurgen S. 2006. Ecological effects of soil compaction and intial recovery dynamics: a preliminary study. Eur J Forest Res (2006) 125: 129-138.

Wallace, L.L., S.J. McNaughton and M.B. Coughenour. 1985. Effects of clipping and four levels of nitrogen on the gas exchange, growth and productivity of two east African graminoids. Amer. J. Bot. 72:222-230.

Warren, S.D., W.H. Blackburn and C.A. Taylor. 1986. Effects of season and stage of rotation cycle on hydrologic conditions of rangeland under rotation grazing. J. Range Manage. 39:486-490.

Washington Department of Fish and Wildlife. 2006. Washington State Elk Herd Plan: Colockum Elk Herd. Washington Department of Fish and Wildlife. Olympia, 48pp.

Washington Department of Natural Resouces. 2006. Sharptail snake. Available online @ www.dnr.wa.gov/nhp/refdesk/herp/html/4cote.html

Washington State Noxious Weed Control Board, 2008 List. http://www.nwcb.wa.gov/

West, N.E. 1990. Structure and function of microphytic soil crusts in wildland ecosystems in arid to semi-arid regions. Advan. Ecol. Res. 20:179-223.

West, N.E., F.D. Provenza, P.S. Johnson and K.M. Owens. 1984. Vegetation changes after 13 years of livestock grazing exclusion on sagebrush semi-arid desert in West Central Utah. J. Range Manage. 37:262-264.

Westoby, M, B. Walker and I. Noy-Meir. 1989. Opportunistic management for rangelands not at equilibrium. J. Range Manage. 42:266-274.

Wiens, J.A. 1985. Vertebrate responses to environmental patchiness in arid and semi-arid ecoystems, p. 193 *In:* S.T.A. Pickett and P.S. White. The ecology of natural disturbance and patch dynamics, Academic Press. San Diego, CA.

Wilcox, B.P. and M.K. Wood. 1988. Hydrologic impacts of sheep grazing on steep slopes in semiarid rangelands. Journal of Range Management 41:303-306.

Williams, O.B. 1970. Population dynamics of two perennial grasses in Australian semi-arid grassland. J. Ecol. 58:869-876.

Williamson, S.C., J.K. Detling, J.L. Dodd and M.I. Dyer. 1989. Experimental evaluation of the grazing optimization hypothesis. J. Range Manage. 42:149-152.

Wissel, C. 1984. A universal law of the characteristic return time near thresholds. Oecologia 65:101-107.

Woodmansee, R.G. 1978. Additions and losses of nitrogen in grassland ecosystems. BioScience 28:448-453.

Worthington, Viva. 2008. Swauk Allotment Management Plan - Botany/Invasives Report.

Young, J.A. 1994. Historical and evolutionary perspectives on grazing of western rangelands, p. 1-12. *In:* Ecological implications of livestock herbivory in the west. Society for Range Management. Denver, CO.

Young, J.A., R.E. Eckert and R.A. Evans. 1979. Historical perspectives regarding the sagebrush ecosystem, p. 1-13. *In:* The sagebrush ecosystem: a symposium. Utah State Univ., Logan, UT.

Appendix B: Applicable Management Direction

Northwest Forest Plan Standards and Guidelines

Late-Successional Reserves
Adjust or eliminate grazing practices that retard or prevent attainment of reserve objectives. Evaluate effects of existing and proposed livestock management and handling facilities in reserves to determine if reserve objectives are met. Where objectives cannot be met, relocate livestock management and/or handling facilities. (ROD Page C-17)

Matrix
Matrix lands have no management direction specific to grazing, although where riparian reserves (below) overlay matrix, grazing direction in riparian reserves applies.

Riparian Reserves
Standards and guidelines prohibit and regulate activities in Riparian Reserves that retard or prevent attainment of Aquatic Conservation Strategy Objectives. The Northwest Forest Plan establishes interim widths for Riparian Reserves. Interim Riparian Reserve widths vary depending on whether streams are fish bearing or not, whether streams are seasonal or perennial, and the size of wetlands and ponds. Based upon riparian reserve designation in the Swauk Watershed Analysis, past projects within the project area and field reconnaissance, the interim riparian reserve widths will apply.

Within riparian reserves specific standards and guidelines apply. Riparian Reserve standards and guidelines for grazing management are:

- GM-1. Adjust grazing practices to eliminate impacts that retard or prevent attainment of Aquatic Conservation Strategy objectives. If adjusting practices is not effective, eliminate grazing. (ROD Page C-33)
- GM-2. Locate new livestock handling facilities and/or management facilities outside of Riparian Reserves. For existing livestock handling facilities inside the Riparian Reserve, ensure that Aquatic Conservation Strategy objectives are met. Where these objectives cannot be met, require relocation or removal of such facilities. (ROD Page C-33)
- GM-3. Limit livestock trailing, bedding, watering, loading, and other handling efforts to those areas and times that will ensure Aquatic Conservation Strategy objectives are met. (ROD Page C-34)

The Swauk is not a Key Watershed. The Swauk Watershed Analysis was completed on the watershed in 1997. Recommendations from the Swauk WSA are described in the guidance section below. Watershed restoration has been on going in the watershed included in the allotment.

Aquatic Conservation Strategy
The Aquatic Conservation Strategy (ACS) was developed to maintain and restore the ecological health of watersheds and aquatic ecosystems within the Northwest Forest Plan

area. This approach seeks to prevent further degradation and restore habitat over broad landscapes. The ACS includes nine objectives to maintain and restore watersheds, aquatic, and riparian ecosystems. Consistency with the ACS requires that management activities maintain acceptable conditions and not retard or prevent attainment of the objectives identified below.

Wenatchee National Forest Land and Resource Management Plan (WFP) Standards and Guidelines*

*The numbering system that appears with each standard and/or guideline is not intended to occur in ascending chronological order. Each reference is derived directly from the Forest Plan and therefore, coincides directly with the standard as identified in the Forest Plan.

Forest Range Management Goals

Develop, protect and manage the range resource to maintain and improve vegetative conditions compatible with the management area goal. (WFP Page IV-3)

Provide opportunities to enhance other resource values through the use of livestock to shape desired plant communities. (WFP Page IV-3)

Standards and Guidelines

Planning and Inventory

Allotment management plans will be written or revised to meet the goals and objectives for the management area in which the allotment is located. (WFP Page IV-88)

Areas of suitable range outside of existing allotments will be incorporated into existing or new allotments for use by livestock to help:

a. Solve overuse problems;
b. Meet other resource objectives;
c. Meet demand for forage. (WFP Page IV-88)

As part of the analysis of new allotments or re-analysis of existing allotments:

A. Identify lands in unsatisfactory condition. Develop allotment management plans with specific objectives for the lands on a priority basis under a schedule established by the Forest Supervisor. These objectives will define a desired future condition based on existing and potential values for all resources. The allotment plan will include: 1) a time schedule for improvement; 2) activities needed to meet forage objectives; and 3) an economic efficiency analysis. (WFP Page IV-89)
B. Identify allotments with riparian areas in unsatisfactory condition. (WFP Page IV-89)
C. Range allotment management plans will include a strategy for managing riparian areas. A measurable desired future riparian condition will be established based on existing and potential vegetative condition. When the current condition is less than that desired, objectives will include a schedule for improvement. The

allotment management plans will identify the actions needed to meet riparian objectives within a specific timeframe. Measurable objectives will be set for key parameters, such as stream surface shaded, streambank stability, and shrub cover. This process is described in "Managing Riparian Ecosystems (Zones) for Fish and Wildlife in Eastern Oregon and Eastern Washington" (1979). The plan will address the monitoring needed to determine if the desired rate of improvement is occurring. Allotment management plans currently not consistent with this direction will be developed or revised on a priority basis under a schedule established by the Forest Supervisor. (WFP Page IV-89)

2. Utilize livestock as a tool to manipulate vegetation in achieving other resource objectives. (WFP Page IV-89)

3. Forage utilization by livestock will generally follow established allowable use guides (Tables IV-17 and IV-18), however, percent use will be adjusted up or down to meet total resource needs. (WFP Page IV-89)

TABLE IV-17 – FOREST PLAN ALLOWABLE USE OF AVAILABLE FORAGE 1/ RIPARIAN AREAS				
MAXIMUM ALLOWABLE UTILIZATION (percent)				
Range Resource Management Levels (FSH 2209.21 R-6)	Grass and Grass-like 2/		Shrubs 3/	
	Satisfactory Condition 4/	Unsatisfactory Condition 5/	Satisfactory Condition 4/	Unsatisfactory Condition 5/
B – Livestock use managed within current grazing capacity by riding, herding and salting. Cost-effective improvements used only to maintain stewardship of the range.	40	0-30	30	0-25

1/ This would be incorporated in Allotment Management Plans. Allotment Management Plans may include utilization standards which are either lower or rarely higher, when associated with intensive grazing systems and specific vegetation management objectives which will meet objectives for the riparian dependent resources. Includes annual cumulative use by big game and livestock.
2/ Utilization based on percent removed by weight
3/ Utilization based on incidence of use, weight, and or twig length.
4/ Satisfactory Condition -see glossary (satisfactory condition is determined by allotment classification and/or forage condition).
5/ Unsatisfactory Condition – see glossary (anything not "satisfactory").
(WFP Page IV-90)

TABLE IV-18 – FOREST PLANALLOWABLE USE OF AVAILABLE FORAGE 1/ SUITABLE RANGE (EXCEPT RIPARIAN)						
MAXIMUM ALLOWABLE UTILIZATION (percent) 2/						
Range Resource Management Levels (FSH 2209.21 R6)	Forest		Grassland		Grass and Grass-like	
	Satisfactory Condition 4/	Unsatisfactory Condition 5/	Satisfactory Condition 4/	Unsatisfactory Condition 5/	Satisfactory Condition 4/	Unsatisfactory Condition 5/
B – Livestock use managed within current grazing capacity by riding, herding and salting. Cost-effective improvements used only to maintain stewardship of the range.	40	0-30	50	0-30	40	0-25

1/ This would be incorporated in Allotment Management Plans. Allotment Management Plans may include utilization standards which are either lower or rarely higher, when associated with intensive grazing systems and specific vegetation management objectives which will meet objectives for the riparian dependent resources. Includes annual cumulative use by big game and livestock.
2/ Utilization based on percent removed by weight
3/ Utilization based on incidence of use, weight, and or twig length.
4/ Satisfactory Condition -see glossary (satisfactory condition is determined by allotment classification and/or forage condition).
5/ Unsatisfactory Condition – see glossary (anything not "satisfactory") (WFP Page IV-91)

Soil Standards and Guidelines

Administration and Management

2. Compaction, Displacement, Puddling, Severely Burned – Leave a minimum of 80 percent of an activity area in a condition of acceptable productivity potential for trees and other managed vegetation following land management activities. Surface soil conditions known to result in reduced productivity or loss of productive land surface are: detrimental compaction; detrimental displacement; detrimental puddling; and severely burned. Total acreage of all detrimental soil conditions should not exceed 20 percent of the total acreage within the activity area, including landings and system roads. (WFP Page IV-97).

3. Soil Surface Erosion

   a. Surface erosion – To meet acceptable levels of soil loss and soil management objectives, the minimum percent effective ground cover following cessation of any soil-disturbing activity should be: (WNF Page IV-97)

Erosion Hazard Class	Minimum Percent Effective Ground Cover	
	1st year	2nd year
Low (very slight to slight)	20-30	30-40
Medium (moderate)	30-45	40-60
High (severe)	45-60	60-75
Very High (very severe)	60-90	75-90

8. Where the above standards cannot be met because of specific site conditions, appropriate mitigation measures shall be developed in the project environmental analysis, documented in the project record, and implemented prior to fall rains. (WNF Page IV-97)

9. Sites degraded by management shall be rehabilitated. (WNF IV-97)

Riparian Area Standards and Guidelines

Class I, II and Fish Bearing Class III Streams

1. Sediment (WFP Page IV-86)
   a) Fines - Maintain <20 percent fines (less than or equal to 1.0mm) as the areas weighted average in spawning habitat.
   b) Turbidity – Meet State water quality standards for turbidity.

2. Temperature (WFP Page IV-86)
    a) The maximum temperatures will be less than or equal to 61 degrees Fahrenheit on any day and/or the average 7-day maximum temperatures will be less than or equal to 58 degrees Fahrenheit.
    b) Where stream temperatures naturally exceed the above standards, management activities will not cause further measurable temperature increase.

3. Floodplain/Riparian Vegetation (WFP Page IV-87)
    a) Vegetative ground cover – Maintain greater than or equal to 90 percent vegetative ground cover provided by trees, shrubs, grasses, sedges and duff within the floodplain and true riparian zone.
    b) Maintain riparian habitat diversity associated with deciduous trees as would be expected on the site.

Non-Fish Bearing, Class III Streams

1. Riparian Management Areas (RMAs) associated with non-fish bearing, perennial streams are managed to meet standards and subdrainage objectives for fish habitat, water quality and riparian associated wildlife habitat. (WFP Page IV-87)
    a) Sediment – Limit sediment loading and maintain channel conditions necessary to meet standards in fish-bearing streams.
    b) Temperature – Management along these streams will not increase temperatures in fish bearing streams above standards.
    c) Floodplain/Riparian Vegetation – Maintain greater than or equal to 90 percent ground cover provided by trees, shrubs, grasses, sedges and duff with the floodplain/true riparian zone.

Class IV Streams, Seeps and Springs (WFP Page IV-88)

1. Manage Class IV streams so as to not adversely impact water quality, fish habitat, and viable wildlife populations and water quality in the subdrainage.

Invasive Species Standards [Preventing and Managing Invasive Plants-Record of Decision (2005)]. Standards that apply to grazing and allotment management planning are:
1. Prevention of invasive plant introduction, establishment and spread will be addressed in watershed analysis; roads analysis; fire and fuels management plans, Burned Area Emergency Recovery Plans; emergency wildland fire situation analysis; wildland fire implementation plans; grazing allotment management plans, recreation management plans, vegetation management plans, and other land management assessments.

4. Use only pelletized or certified weed free feed on all National Forest System lands. If state certified weed free feed is not available, individual Forests should require feed certified to be weed free using North American Weed Free Forage Program standards or a similar certification process. This standard may need to be phased in as a certification processes are established.

6. Use available administrative mechanisms to incorporate invasive plant prevention practices into rangeland management. Examples of administrative mechanisms include, but are not limited to revising permits and grazing allotment management plans, providing annual operating instructions, and adaptive management. Plan and implement practices in cooperation with the grazing permit holder.

Other Applicable Management Guidance

Relevant resource information and management guidance from the following documents was utilized in the development of the proposed alternatives. The documents identified below provide information pertinent to this analysis in terms of a larger scale assessment of the landscape (i.e., 5th-field watersheds and Late Successional Reserves) which included "on-going activities" such as ungulate grazing. In this respect, these documents were utilized to identify areas of concern, establish a desired future condition and identify opportunities for moving the watershed toward the improved ecological condition. These documents are hereby incorporated by reference.

- Wenatchee National Forest, Late-Successional Reserve and Managed Late-Successional Area Assessment (USDA 1997a). The entire allotment is located within the Swauk LSR. Management emphasis for the last 15 years has been on the creation and maintenance of late-successional forest habitats.

- Swauk Watershed Assessment (USDA 1997).

  Reduce the proportion of introduced non-native plant species by preventing their spread and establishment from management activities such as livestock grazing.

  Reduce soil compaction risk from disturbance related to mining, recreation, grazing, logging and roads.

  Increase incorporation of organics in the surface soil layer and mineral soil horizons. Increase retention of moisture in surface soils by increasing the distribution of course organic debris.

  Maintain or restore healthy, functioning riparian zones.

  Areas that are slumpy in nature will be avoided or carefully managed from roading, grazing, harvesting, and recreation activities.

Riparian areas sufficient in size to preserve all of the components necessary for a functioning riparian zone and to achieve the ACS objectives over the longterm (beyond 10 years).

Sufficient riparian vegetation composed of both conifer and hardwood species to provide summer and winter thermal buffers.

Desired conditions developed relative to grazing for the Swauk Allotment analysis area also included those identified in the Wenatchee National Forest Land and Resource Management Plan (Pages IV-11 and IV-20, Vegetation: Forage):

In the first ten years, emphasis on management will be placed on revision of outdated range allotment plans, and more intensive administration of existing range allotments. With updated management plans, enhancement of other resources through use of livestock will begin. Increases in livestock use will be accommodated through more intensive management on existing allotments.

By the end of the 50 year planning horizon, most of the acres of suitable livestock range within allotments will be under some form of grazing management. Resource managers will be using livestock as a tool to manage the vegetative resource.

Suitable livestock range will be in an improved forage condition with an upward trend in ground cover and species composition. These improved conditions will contribute to the protection of soils and watersheds. Not all of the suitable livestock range will be used each year. On key big game range for example, livestock will be used only to maintain the already improved big game forage, or occasionally to utilize forage in excess of game needs. Forage production on the Forest will still exceed the amount needed for big game and livestock, even though the numbers of big game and livestock using the Forest have increased each decade.

Permanent range improvements will still be installed and maintained. However, many fences and water developments will utilize materials which can be easily moved from one location to another. These temporary improvements will allow managers more flexibility in treating site specific areas, such as riparian zones and forage areas created through timber harvest.

Legislative Documents That Have a Bearing on This Decision

- The National Environmental Policy Act of 1969 (NEPA), as amended (42 U.S.C. 4321 et seq.). The Council on Environmental Quality implementing regulations at 40 CFR Parts 1500-1508 and Forest Service implementing policy and procedures issued in 36 CFR 220 and the Forest Service Manual 1950 and Forest

Service Handbook 1909.15 established the basic process for conducting and documenting environmental analyses, including public participation. Before a permit can be issued, a decision to authorize grazing must assess the site-specific impacts of the grazing activity, except in limited situations involving permit expirations or waivers as provided for in the Rescission Act of 1995.

- The Rescission Act of 1995 (Public Law 104-19). Section 504 (a) requires each National Forest System unit to identify all allotments for which NEPA analysis is needed. These allotments must be included in a schedule that sets a due date for the completion of the requisite NEPA analysis. Section 504 (a) requires adherence to these established schedules.

- The Multiple Use-Sustained Yield Act of 1960 (U.S.C. 528 et seq.). The Multiple Use-Sustained Yield Act provides that National Forests are established and administered for several purposes, including range purposes. The Act also authorizes the Secretary of Agriculture to develop the surface renewable resources of the National Forest System for multiple uses and sustained yield of the services and products to be obtained from these lands, without impairment of the productivity of the land.

- The Federal Land Policy and Management Act of 1976, as amended (43 U.S.C. 1700 et seq.).

    a. Permit Duration. Section 402(a) (43 U.S.C. 1752(a)) specifies that, as a general rule, grazing permits must be issued for ten year terms.

    b. Allotment Management Plans. Section 402(d) (43 U.S.C. 1752(d)) authorizes the Secretary to incorporate allotment management plans into grazing permits and requires that, if the Secretary elects to develop allotment management plans, they shall be developed in careful and considered consultation, cooperation, and coordination with permittees, landowners, and any State having lands within the allotment. Forest Service regulations at 36 CFR 222.2 require allotment management plans.

- The Forest and Rangeland Renewable Resources Planning Act of 1974, as amended by the National Forest Management Act of 1976, as amended (16 U.S.C. 1600 et seq.). The National Forest Management Act of 1976 (NFMA) requires each National Forest System unit to have a land and resource management plan (LRMP). Section 6(i) of NFMA (16 U.S.C. 1604(i)) requires that resource plans and permits for the occupancy and use of National Forest System lands must be consistent with the LRMP for the National Forest System unit on which that use or occupancy occurs. Pursuant to section 6(i), allotment management plans, or grazing permits must be modified, if necessary, upon amendment or revision of a LRMP to make them consistent with the LRMP.

- The Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.). Implementation regulations for the Endangered Species Act of 1973 (ESA) are found in 50 CFR Part 402. The policy and process for Forest Service compliance with the ESA are found in Forest Service Manual 2670.31. Section 7 of the ESA (16 U.S.C. 1536(c)) requires completion of a Biological Assessment (BA) for federal actions that may affect threatened or endangered species. Forest Service policy at Forest Service Manual 2670 requires a Biological Evaluation (BE) to review all programs and activities for possible effects on endangered, threatened, proposed, or sensitive species.

- Executive Order 13186, regarding the consideration of the conservation needs of bird species of concern in the design, analysis, and implementation of activities on federal lands.

- The National Historic Preservation Act, as amended (16 U.S.C. 470). Under the statutory definitions of the 1992 amendments to the Act, "permits" are undertakings subject to the requirements of Section 106 of the Act. The implementing regulations that apply to grazing permit applications are found at 36 CFR Part 800. A National Programmatic Agreement (PA) on grazing between the Advisory Council on Historic Preservation and the Forest Service establishes options for meeting the requirements of Section 106 of the Act. Text of the agreement is found at Forest Service Manual 1539.61.

- The Clean Water Act, as amended (33 U.S.C. 1251 et seq.). The Clean Water Act (CWA) places primary responsibility for protecting water quality with the States. Section 313 of the Act (33 U.S.C. 1323) requires Federal agencies to comply with all substantive and procedural State water quality requirements to the extent as any nongovernmental entity.

    a. Nonpoint sources pollution. Section 319 (33 U.S.C. 1329) addressed nonpoint source pollution, which is an important concern in the management of livestock grazing. States are required to identify impaired waters in the State, categories of and particular nonpoint sources of pollutants, best management practices (BMPs), and to provide for a process of reviewing Federal assistance programs and development projects to assure consistency of those programs or projects with State nonpoint source pollution management programs. Federal agencies must ensure that the opportunity for such a review process exists. Section 92.3 addresses the application of BMPs to grazing authorization.

- Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C 1801). The Magnuson-Stevens Fishery Conservation and Management Act requires, under Section 305(b)(2) and 50 C.F.R. 600 Subpart K, that Federal agencies consult with NOAA Fisheries regarding actions that are authorized, funded or undertaken by that agency that may adversely affect Essential Fish Habitat (EFH).

- The Granger-Thye Act (1950) (16 U.S.C 580l). The Granger-Thye Act authorizes the Secretary of Agriculture to regulate grazing on National Forest administered lands by issuing permits for grazing of livestock for not to exceed ten years.

- The Public Rangelands Improvement Act (1978) (43 U.S.C. 1901-1908). The Public Rangelands Improvement Act establishes and reaffirms a national policy and commitment to manage, maintain and improve the condition of the public rangelands so that they become as productive as feasible for all rangeland values in accordance with management objectives and the land use planning process.